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HATCHERY MANAGEMENT

HATCHERY MANAGEMENT

by

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REVISED AND RESET



ILLUSTRATED

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PREFACE

DOZENS OF GOOD books have been written about poultry management practices, but this volume attempts to bring together in concise and systematic fashion present day knowledge concerning the problems encountered in the commercial production and marketing of chicks. It is written for beginners as well as for experienced hatchery operators.

Originally published in 1932, this volume has undergone a complete revision, and it has been expanded considerably to include new information, particularly that dealing with flock improvement methods and incubation practices. A chapter has been added on chick sexing. Fair trade practices for the hatchery industry are covered in a new chapter.

Because advertising and selling methods are so important in determining the success of the hatchery operator, a large portion of this volume has been devoted to the merchandising phase of hatchery management. It is not the intention to outline specific advertising and sales programs that can be followed by hatcheries, but merely to set forth certain well recognized principles of selling. Most of the selling examples used in this book have been employed by hatcheries known to have been particularly successful.

Criticisms of this volume and suggestions as to material that would enhance the value of future editions will be welcome.

June, 1946.

ROLAND C. HARTMAN
G. S. VICKERS

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HATCHERY MANAGEMENT

• HISTORY OF MAMMOTH INCUBATION •

ARTIFICIAL INCUBATION of eggs on a large scale is not new. Centuries before Christ, the ancient Egyptians and Chinese were practicing the art of hatching by mechanical means. And because the skill and knowledge of hatching has been passed down from generation to generation in certain families, we find these primitive methods of artificial incubation still in existence in Egypt and China.

Egyptian Methods of Incubation.—Reaumur, the Frenchman who in 1750 successfully hatched chicks by surrounding a cask of eggs with heating horse manure, gave one of the earliest descriptions of an Egyptian incubator in his "Treatise on the Art of Hatching and Bringing up Domestic Fowls," published in 1750. His description agrees quite closely with that of Mahommed Askar Bey, Egyptian delegate to the 1927 World's Poultry Congress at Ottawa, Canada.

Bey described the present Egyptian incubator as "a mud structure having the external appearance of an Egyptian farmer's 'Fel-lah' dwelling, the only difference being that the outer walls are doubled. A narrow passage divides the incubator into two equal parts, each part having the same number of ovens. Adjoining the incubator is the fireroom. The fuel used is decaying straw-chaff or inedible 'tibin,' and a low constant warmth is maintained."

Two weeks before starting incubation, tibin or finely chopped straw is spread over the floor of the corridor and lower compartment, then set on fire with smoldering ashes to produce a slow combustion by limiting the amount of air. Shortly before the eggs are to be placed in the incubator, the ashes are cleared out, but glowing fuel is placed in the side troughs or grooves in the upper compartment.

Eggs are collected from neighboring markets and brought on the backs of camels and donkeys to the incubators where the specially hired, trained operators reject all small eggs or those that have

cracked shells. The eggs are then placed in the lower compartment which holds about 6,000 eggs.

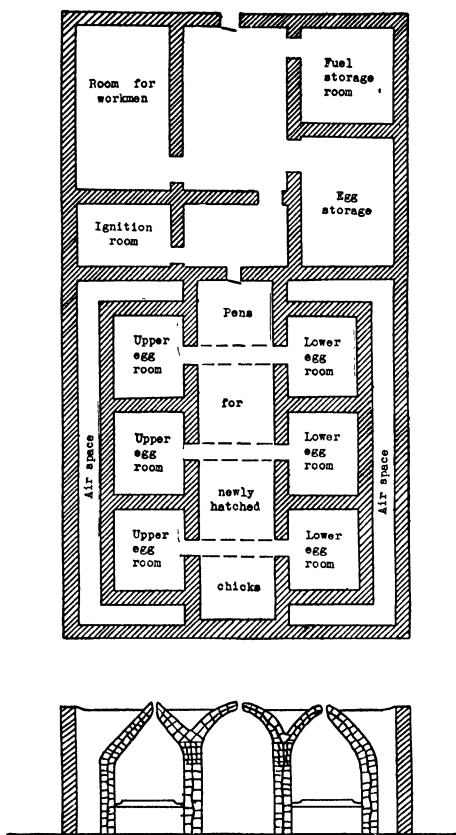


Fig. 1.—Diagram of an Egyptian incubator. Above, floor plan. Below, cross-section view of egg overs.
(Drawn by R. Treat after Bey.)

On the first day, the eggs are turned three times and their position changed to bring those farthest away from the fires nearest, and vice versa. For the next nine days, the eggs are turned and moved twice daily, and fuel is added twice daily, but on the evening of the tenth day, all ashes are removed, and the heat is supplied by the

developing embryos. On the thirteenth day, half of the eggs are placed in the upper compartment and spread out one by one, and the same is done with those left in the lower chamber. Eggs are then turned twice daily until the twentieth day when they are given a final turning. As the chicks hatch on the twenty-first day, they are removed from the hatching chambers to the corridor every three hours.

Testing of eggs is done on the seventh day by candling with an oil lamp or by holding the eggs up to an aperture in the roof through which the sun is shining. Most interesting is the manner in which the correct temperature is determined. The operator simply holds the egg up against his eyelid to determine the warmth.

The operator is expected to turn over to the proprietor chicks equal to two-thirds of the number of eggs given to him for hatching. If he fails to secure that many chicks, he must pay for the shortage. If the hatch goes over two-thirds, the surplus constitutes his wages, and he sells those chicks to the proprietor who pays him in infertile eggs, 100 chicks being valued at the market price of 150 eggs.

Chinese Methods of Incubation.—The Chinese methods, of which there are several, are somewhat different. One of these was described by M. E. Kern in *Hatchery Tribune* in telling of a visit to a duck hatchery in China. He described the incubator as a "long, boxed up deck" at one side of the room, and in this were several large baskets, each of which had a capacity of 5,000 eggs. These baskets were surrounded by rice chaff.

In setting this unique incubator, a layer of heated wheat in a "round shaped gunny sack" is placed in the bottom of the basket, then alternately layers of eggs and bags of heated wheat until the basket is full. Early in incubation, the eggs are candled by sunlight, and the infertiles are removed and sold on the market. The eggs are taken out twice daily for turning.

Because of scarcity of fuel, extreme measures for economizing heat must be taken. After two days in the incubator, the eggs not only generate enough heat to keep themselves warm without the aid of heated wheat, but also enough to warm new eggs. As new eggs are put in, they are alternated with layers of old eggs.

When the eggs are ready to hatch, they are placed on an overhead shelf, covered with a cloth and left to hatch out.

Philippine Methods.—Methods used to hatch duck eggs in the Philippine Islands closely resemble those of the Chinese, and bags of heated rice hulls are alternated with bags holding about 125 eggs and placed in baskets. Before the eggs are bagged, however, they are placed in the sun until sufficiently warm. The rice hulls are taken out twice a day and heated in an iron pan shaped like the trench helmet used by the Allies in World War I. While the rice hulls are being heated, the eggs are turned. On the twentieth day, the eggs are removed from the incubators, placed on a table covered with mats, paper or cloth, and rice hulls. The eggs are then covered with cotton cloth and turned daily until the shells are pipped. No heat is supplied in this stage, since the heat generated by the developing embryo is considered sufficient.

To us who have at our disposal incubators in which the temperature and humidity control are automatic and in which it is possible to turn thousands of eggs with one turn of a lever, these methods are extremely crude, yet, as a matter of fact, mammoth incubators in America are of comparatively recent origin.

First Mammoth in America.—Although the first American incubator was invented in 1844, according to W. A. Lippincott in *Poultry Production*, it was not until 1895 that the first mammoth incubator made its appearance in America. In that year, Charles A. Cyphers built a 20,000 egg duck incubator on the farm of William H. Truslow at Stroudsburg, Pa.

This incubator consisted of a building 20 by 20 feet with an addition or wing containing the hot water boiler. The incubating room proper was 15 feet square with felt walls and ceiling. The tray racks were 10 tiers high, and the eggs were turned on rollers, a draw bar turning an entire row of trays at once. The hot water pipes were located underneath the board walk around the felt enclosed incubating room, the heat moving upward and diffusing through the felt walls into the incubating chamber proper and then coming down through a 12 inch exhaust tube, about 6 feet below the bottom tier of eggs, connected with the boiler room. This was the only source of air for the boiler and provided the means of drawing the foul air from the incubator. Fresh air entered the building beneath the heating pipes.

In case the temperature ran too high, or too low, a thermostat

actuated a spring motor which closed or opened the drafts on the boiler, while another thermostat opened and closed an exhaust valve in the ceiling of the outer room.

Some excellent hatches were secured in this incubator, but it was never possible to utilize the full capacity of the incubator, because



Fig. 2.—(Top) Interior of a Chinese hatchery. Photo from *Hatchery Tribune*. (Bottom) Heating duck eggs in direct sunshine prior to placing them in Philippine mammoth incubators. Photo from F. M. Fronda, University of the Philippines.

there was too wide a range of temperature between the top and bottom, although it was possible to keep a constant temperature at any one level.

Since the day old chick business had not developed, there was no incentive for Cyphers to continue his experiments with the mammoth, so he kept on with the manufacture of small incubators.



Fig. 3.—Interior view of the Cyphers mammoth incubator erected on the Truslow farm at Stroudsburg, Pa., in 1895.
(*Poultry, Garden and Home.*)

Further Development of the Mammoth.—Nearly 10 years passed after the erection of the Cyphers incubator before anything more was heard about mammoth incubators, but several inventors were already at work. Chief among these was W. P. Hall who about 1901 built a long, many-compartment incubator heated with a single coal burning stove, but it was not until 1908 that he placed it on the market. Only two machines were sold that year, but by the end of five years, 200 were being sold annually.

The Cyphers Incubator Company in 1904, under different management than that which built the Truslow incubator in 1895, began to experiment with a long, many-compartment incubator heated with a coal burning hot water boiler, and in 1905 a 4,000 egg, double deck incubator was erected on the Cyphers Company Poul-

try Farm at Elma, New York. In 1907 a Cyphers incubator of this type with a capacity of 36,000 duck eggs, was erected on the farm of A. J. Hallock, Speonk, L. I. From 1907 to 1912 a number of these machines were sold.

The first truly sectional incubator was the Candee which came on the market in 1911. With this machine, it was possible for the purchaser to start out with a small capacity and add sections as his business increased. The Candee Incu-Brooder, so named because it had a nursery tray below the egg tray, was the invention of a Mr. Candee, a fancier of Fayetteville, N. Y., who built his first incubator about 1902 or 1903.

Soon after the appearance of the Candee came the Newtown, largely the work of Harold L. Watson, then the Blue Hen in 1916, and the Mackay, later to become the basis for the Jamesway Incubator-Hatcher.

Invention of the Smith Mammoth.—Most significant and far reaching in effect was the invention of the Smith incubator, patented in 1918. Its appearance marks one of the high points in the development of the hatchery industry, for it gave a new and greater stimulus to the then slowly developing baby chick business.

The incubator that Charles Cyphers built back in 1895 was undoubtedly the first attempt at building a room type machine. All mammoth incubators developed after the failure of the Cyphers machine and up to the appearance of the Smith incubator were really enlargements of the small lamp incubator and demonstrated only one principle, namely, that it was possible to incubate a large number of eggs at one time using one central heater.

Dr. S. B. Smith made his first attempt to build an incubator in 1901 after observing the difficulties of a friend in Texas who was trying to hatch with a small portable incubator, but he didn't have much success and gave up the idea. Returning to Ohio in 1905, he visited the 12,000 egg hatchery of M. Uhl and Co., New Washington, Ohio, observed the ease with which Mr. Uhl produced and sold chicks, decided that he would go into the business himself, and went back home and built two experimental incubators, not of the cabinet type, however.

His next venture was the building of a 65,000 egg room type incubator at Lykens, Ohio, in 1906. A blower operated by a gaso-

line engine forced air through the machine. Lacking capital, only 30,000 eggs were placed in the machine. The result, however, was a total failure. Having an opportunity to take over a medical practice in Attica, Ohio, his home town, Dr. Smith moved there, took up

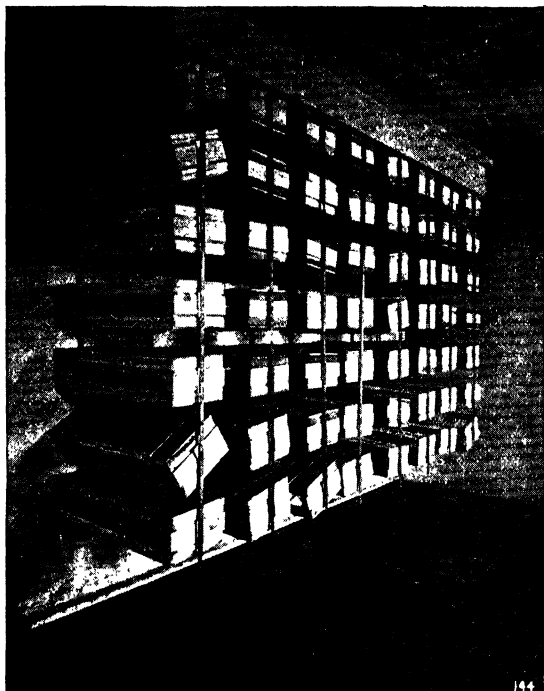


Fig. 4.—Method used to suspend hatching eggs in one of Dr. S. B. Smith's early forced draft incubators. (*Smith Incubator Co.*)

his experimental work again, only to have financial distress once more. Business men helped him to re-establish his baby chick business, but advised him to withhold his experiments until he was financially able to do so again.

Dr. Smith's experiments, consequently, were at a standstill for several years, but the next machine that he constructed was the basis

for the present Smith. This machine, which consisted of three rooms, each 10 by 12 feet, with a $9\frac{1}{2}$ foot ceiling, was installed in an old church building in Cleveland early in 1913. Dr. Smith first tried to start a full room of new eggs at one time, but later found it advisable to set twice a week.

Briefly, the Smith incubator solved the problem of incubating eggs in a room with the eggs in different stages of incubation. In place of heating the air in the egg chamber, hot air was driven into the machine at high speed. Again, instead of the customary 103 degrees in all parts of the egg chamber, the temperature was 99 degrees.

When Dr. Smith patented his invention in 1918, the Buckeye Incubator Company, an old established company, was licensed to make the machine in smaller sizes, while Dr. Smith reserved the right to manufacture machines of a larger capacity, and he continued to build machines to equip his own hatchery, the Smith Standard Company, until it finally had a capacity of 1,034,880 eggs, the largest commercial hatchery in the world at that time.

Dr. Smith, however, having reserved the right to manufacture room type, forced draft incubators in larger sizes, finally decided to use this right, and in 1922 introduced the Smith Incubator at the International Baby Chick Association convention at Cedar Point, Ohio.

Here was a machine that was remarkably compact, requiring only about one-fifth the floor space needed for the smallest triple deck mammoth of equal capacity. Furthermore, its operation required considerably less labor than a sectional incubator. Approximately 100 machines were sold during the first convention exhibit.

Later Incubator Developments.—Ira M. Petersime built the first electrically heated and electrically regulated mammoth incubator in 1922, placing it on the market in 1923. Although of the cabinet type, the Petersime did not employ the forced draft principle, but uniformity of temperature and circulation of air were accomplished with a paddle wheel that revolved slowly around a circular drum of trayed eggs.

The Smith, Buckeye, and Petersime incubators have undergone many improvements since their introduction, and other makes of incubators, embodying new features, were placed on the market.

The Bundy Incubator Company is credited with having introduced the first separate hatcher or hatching compartment in 1928.

During the thirties, the most significant changes in incubator construction were concerned with refinements in design, electrification of practically all machines, more automatic temperature and humidity control, introduction of labor saving devices, and almost general adoption of separate hatches or hatching compartments.

When the Smith patents expired in 1935, the Smith Incubator Company brought out a machine with a capacity of 78,000 eggs, and the Buckeye Incubator Company, no longer bound by limitation on size, brought out a streamlined model with 48,000-egg capacity.

Patent Litigation.—For a period of about 10 years ending with a United States Supreme Court decision of April 26, 1937, declaring invalid the Smith patent, incubator patents were the subject of considerable litigation. Hatcherymen were kept in a state of confusion because of the claims and counter claims, reversal of lower court decisions by higher courts, and the fact that suits were generally directed against the purchasers of machines alleged to have infringed upon the patents rather than against the manufacturers of such machines.

The Smith patent expired on April 16, 1935, but the bitter controversy and litigation did not end until April 26, 1937, when the United States Supreme Court held that the principle of hatching eggs in staged incubation had been established by Milo Hastings, a former employee of the U. S. Department of Agriculture and later well known as a writer on health subjects.

Hastings had constructed an incubator employing staged incubation in Brooklyn in 1911, and another in Muskogee, Oklahoma, the same year. He made application for a patent on May 3, 1911, and had filed other papers on it the following year, but he failed to follow through because of lack of funds. The machine at Muskogee had a capacity of 30,000 eggs, and it was operated during the seasons of 1912 and 1913.

II

COMMERCIAL HATCHING IN AMERICA

THE COMMERCIAL hatching industry in America appears to have had its start about the same time in New Jersey and in the Petaluma district of California.



Fig. 5.—The late Christopher Nisson, pioneer hatcheryman on the Pacific Coast. (*Courtesy Pioneer Hatchery.*)

The late Christopher Nisson, according to Klein (1926), in the early eighties was already selling baby chicks to his neighbors near Petaluma, California. The early records of Nisson's business were destroyed in a fire, but the written history of his business begins in

1892. That year 14 customers purchased a total of 4,600 chicks at 6 and 7 cents each, one customer buying 1,000.

Joseph D. Wilson, Stockton, N. J., is generally given credit as the first commercial hatchery operator, because he is considered the first man to advertise the sale of chicks in a poultry magazine. According to Kilpatrick (1924), Wilson's first advertisement appeared in the *Poultry Keeper* in the spring of 1892, and in that year he made the first long distance shipment of chicks when he shipped 50 Barred Rock chicks by express from Stockton to a customer in a

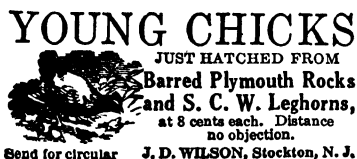


Fig. 6.—A reproduction of one of J. D. Wilson's earliest baby chick advertisements. It appeared in the *American Poultry Advocate* during 1895.

suburb of Chicago. During that same season, shipments were made to New Jersey, New York, Pennsylvania, Connecticut, Massachusetts, Illinois, Kentucky and Tennessee. Wilson's sales that year totaled \$487.29.

Early Commercial Hatcheries.—Pioneer among the large scale shippers of baby chicks was M. Uhl, New Washington, Ohio, who, taking his cue from Joseph Wilson, began shipping chicks over limited distances as early as 1900, operating under the name of M. Uhl & Company. He is believed to be the first man to use mammoth, coal-heated, hot water incubators to hatch chicks on a commercial scale.

Apparently commercial hatching did not make much headway until about 1908 and 1909 when mammoth incubators began to appear on the market. In 1909, Lakewood Farm, Lakewood, N. J., and Pittsfield Farm, Pittsfield, Maine, began to use large space in poultry publications to advertise baby chicks. R. W. Kerr, Frenchtown, N. J., later to become one of the largest operators in the East, started his hatchery that year.

Period of Gradual Expansion.—Even after the appearance of a number of mammoth incubators, the hatchery industry did not make any spurt. The period following 1910 is well described by Knapp (1927):

In 1911, chicks were placed on sale by the 5 and 10 cent syndicates in their chain stores. In the next 10 years, these stores created a demand for millions of chicks, which were sold largely to be raised in city back lots, the prevailing retail price being 10 to 15 cents each.

While the majority of hatcheries up to this time were advertising chicks only from pure bred varieties, the demand for the 10-cent chick induced many operators to increase their capacity beyond their ability to supply good quality. This resulted in enormous numbers of mongrel chicks being distributed by stores all over the country. The hatcheryman could not afford to attempt improvement of stock as long as he could secure only 8 to 10 cents each for his chicks. While an enormous business was being built up, little improvement was being made in quality.

Up to 1915, the better class of hatcheries secured the major part of their business from back-yard breeders in the towns and cities. Shipments of chicks averaged less than 100. Shipments in lots of 25 and 50 were very much more common than at the present time. Very few hatcherymen were specializing on any one variety, but were endeavoring to produce as many varieties as possible. As many as 20 different kinds of chicks were advertised by the larger hatcheries. . . .

The development of the chick industry was not without many perplexing problems. Chief among these was the most decided opposition on the part of fanciers. Well-bred baby chicks from the most popular standard breeds were being offered at the same prices as eggs for hatching. The eggs-for-hatching business naturally suffered a decline. Fanciers appealed to poultry journal editors, resulting in an organized effort to suppress the rising popularity of baby chicks. A few poultry writers who had a better knowledge of hatchery methods showed a disposition to champion the cause of hatcherymen.

At about the same time, the Humane Society for the Prevention of Cruelty to Animals became greatly exercised over the fact that baby chicks were being placed in unheated boxes and shipped on journeys up to three days duration without feed or water. Numerous cities prohibited the sales of chicks in stores on the grounds of cruelty.

Organization of the I. B. C. A.—Faced with these restrictions on baby chick sales and opposition by fanciers, hatcherymen soon realized the need for an organization to fight the battles of the then slowly developing chick industry. Out of a meeting of prominent chick producers in Cleveland, August 9, 1916, came the International Baby Chick Association with Herbert H. Knapp as the first president. Its objects, clearly stated, were: "To foster, promote, improve, and protect the baby chick industry and all allied branches of poultry husbandry."

These hatcherymen were immediately suspected of trying to organize an association counter to the American Poultry Association, but to dismiss such fears, the newly organized group agreed to hold

its meetings in conjunction with the American Poultry Association conventions, and it did so until the hatchery organization was strong enough to stage its own conventions.

There was much to do. Shipping facilities were poor. Chicks were shipped in all sizes and styles of containers. Hatching and shipping of anything other than purebred chicks had to be discouraged. Then came the World War. Transportation difficulties were encountered. Fuel could not be obtained for operation of incubators and brooders. Undismayed by the smallness of its organization, the I. B. C. A. immediately tackled these problems and soon proved the value of the association by its accomplishments.

Chicks Admitted to the Mails.—When the United States entered the World War, transportation facilities became deplorable, and it was practically impossible to ship chicks without terrific losses. The I. B. C. A. in September, 1917, passed a resolution requesting that baby chicks and all live poultry be included in parcel post service, but they failed in their request because they had included all live poultry, and the postal authorities were fearful lest they would have to include parrots, monkeys, snakes and other living things if chicks and live poultry were allowed in the mails.

Herbert H. Knapp, first president of the hatchery organization, did not relax in his efforts to have chicks admitted to the mails. By pointing out to postal officials that the chicks which would be sent through the mails would be a potential help in the purchase of war savings stamps and that they would also supply food to replace beef, pork and mutton which had to be sent to the soldiers across the ocean, he finally succeeded, and on March 15, 1918, day-old chicks could be shipped by parcel post. At the same time, the Fuel Administration issued an order assuring poultrymen an ample supply of anthracite coal for use in the operation of their mammoth incubators and brooders.

Although chicks were admitted to the mails as a one-year emergency measure, the plan proved so satisfactory that it was made a permanent service.

Post-War Expansion.—The hatchery industry continued to make a steady growth following World War I with a considerable increase in interest with the appearance of the Buckeye Mammoth incubators, manufactured under Dr. S. B. Smith's patents, but it

was not until 1922 when Dr. Smith began to market his 40,000 egg incubator, occupying a space of only 10 by 13 feet, that the industry began to undergo rather rapid expansion. It opened the door to large scale, economical hatching. From then on, expansion was rapid.

Several other factors helped to increase the interest in the hatchery chick. In several states, the flock improvement movement under official supervision was already underway; it helped to overcome much of the distrust which existed toward hatchery chicks. Then, too, farmers began to discover that poultry was one of the most profitable crops on the farm, and they began to increase the size of their flocks. Moreover, they found that it saved much time and labor to buy their chicks ready-hatched and raise them under colony brooders.

Although the number of commercial hatcheries in the United States was estimated to be 250 in 1918 and 2,000 in 1922, the figure was placed at 5,000 in 1925, and 9,000 in 1926. By 1927 the number of hatcheries in the United States had reached a total of 10,124 establishments with an egg capacity of 106,435,850, according to a survey made by T. S. Townsley. So rapidly had the industry grown.

Statistics available on the sales of incubators with a capacity of 1,000 eggs or more would indicate that the late twenties was a period of rapid expansion. The figures for 1928 to 1940, inclusive, with the exception of 1932 to 1934 when no census of farm equipment was made, are given in Table 1.

TABLE I.—COMMERCIAL INCUBATORS
(Over 1,000 egg capacity) Manufactured in the United States—1928 to 1940

<i>Year</i>	<i>Total egg Capacity</i>	<i>Year</i>	<i>Total egg Capacity</i>
1928	41,547,200	1936	35,253,122
1929	48,183,500	1937	24,963,760
1930	41,358,496	1938	21,356,558
1931	16,087,060	1939	28,783,295
1935	29,877,040	1940	30,136,899

The decade ending with 1930 saw great changes in the poultry industry of the United States. In that 10-year period, our human population increased 16.1 per cent, while egg production increased

62.6 per cent as a result of expansion of flocks and the increased productivity of layers.

With the recognition of the value of production bred stock, due in part to the publicity given to the work of certain breeders on the Pacific Coast during the early twenties, flock after flock of mongrel hens gave way to flocks of purebred chickens that were uniform in

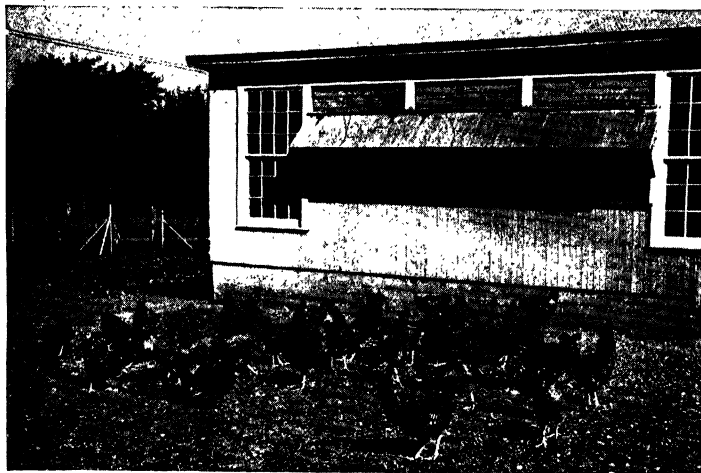


Fig. 7.—Mongrel flocks have given way to purebred flocks of chickens on the majority of American farms.

color, size, and type. Farmers realized that their profits hinged upon the care that their flocks received; so they took up feeding of ready-mixed mashes, bought brooder houses and brooder stoves, and used better feeding appliances.

Probably the most significant improvements in poultry management during the twenties were the extensive use of lights to increase egg production and the feeding of cod liver oil to supply vitamins A and D. The discovery that cod liver oil and other fish oils supplied the sunshine factor, vitamin D, began to change the whole pattern of egg production, for farm hens began to shell out eggs in the dead of winter instead of taking a rest as was their habit before. Moreover, it no longer became necessary to wait until spring to turn

the hens out in the sunshine on green pasture to secure eggs that would hatch.

Expansion of the Thirties.—While the growth of the hatchery industry seemed almost phenomenal during the twenties, its development continued throughout the thirties, despite the industrial and agricultural depression and the droughts of 1934 and 1936. The 1940 census figures revealed a poultry population 11 per cent. less than in the 1930 census, while total egg production also declined 11 per cent in the same period.

While only 18 per cent of the farms in the United States bought hatchery chicks in 1929, this proportion had increased to 47 per cent in 1934, 58 per cent in 1938, and 73 per cent by 1940, according to Bennett and Moore (1941).

TABLE II.—CHICKS HATCHED BY COMMERCIAL HATCHERIES IN THE UNITED STATES

	(Thousands)		(Thousands)
1930	671,576	1938	785,687
1931	516,220	1939	916,409
1932	537,351	1940	859,341
1933	584,547	1941	1,093,300
1934	525,947	1942	1,280,290
1935	649,720	1943	1,609,121
1936	790,749	1944	1,288,491
1937	687,595	1945	1,620,773
		1946	1,213,194

Compiled from U. S. Bureau of Agricultural Economics Hatchery Reports.

The percentage of chickens raised hatched by commercial hatcheries, according to "The Poultry and Egg Situation" issued by the U. S. Department of Agriculture in December 1945, over an eight-year period was as follows:

Year	Per cent	Year	Per cent
1938	70.3	1942	81.8
1939	72.4	1943	84.2
1940	74.6	1944	86.4
1941	78.9	1945	88.6

During the 10-year period, 1934-43, custom hatching declined, according to a special report issued by the U. S. Bureau of Agricultural Economics in April 1944. Custom-hatched chicks comprised only 6.5 per cent of those raised in 1943 compared with 11.9 per cent in 1934. Hatching in small incubators on farms in the United

States decreased from 15.1 per cent of all chickens raised in 1934 to 3.6 per cent in 1943, while hatching with hens decreased from 38.3 per cent to 10.2 per cent in the same period.

The first accurate survey of the hatchery industry was made in connection with the administration of the baby chick code under the National Recovery Act. Warren and Wermel (1935) found that there were 11,405 hatcheries with a total egg capacity of 276,287,000 in the United States on July 1, 1934. Of these, 43.3 per cent had a capacity under 10,000 eggs and accounted for only 6.9 per cent of the nation's hatchery capacity.

It would appear that the majority of commercial hatcheries had been established by the late twenties, that subsequent development of the hatchery industry represented expansion of hatcheries already in existence. This pattern of growth was confirmed by the 1937-38 chick hatchery survey of Termohlen, Warren, and Lamson (1940) who found that the number of hatcheries had dropped to 10,533 since 1934 and that the average size of hatchery had increased from 24,200 eggs to 37,700 eggs. The decrease in number of hatcheries occurred in the group of less than 25,000 capacity, particularly those under 10,000-egg capacity, so it was a case of the small hatcheries becoming fewer and the large hatcheries getting bigger.

The 1937-38 survey revealed a total capacity of 397,413,000 eggs. Commercial hatcheries were operating in 2,113 of the 3,070 counties in the United States, but seven states—Ohio, Iowa, Texas, Pennsylvania, Illinois, Indiana, and New York—contained 39.8 per cent of all the hatcheries and 43.2 per cent of the total incubator capacity reported.

By 1943, the total incubator capacity in the United States had increased to 504,640,000 eggs, while the number of hatcheries had declined to 10,112, according to Kimball, Moore, and Smith (1945). Pennsylvania, with 636 hatcheries, led in number of hatcheries, while Iowa was first in capacity, 43,652,000 eggs.

Trend in Hatchery Size.—Many of the pioneer hatcherymen who went into the business after World War I developed large mail order operations, but as more local hatcheries were established, there was a tendency just before 1930 for some of the large hatcheries to decentralize their operations by starting branch hatcheries. This

enabled these hatcheries to do a greater feed and supply business, secure more custom hatching, and offer more personal service.

Apparently the trend toward decentralization was only a passing stage in the growth of the hatchery industry, for there was no indication of its spread during the thirties. On the contrary, the Termohlen, Warren, and Jamson (1940) survey showed that the greatest growth in number of hatcheries and egg capacity occurred in hatcheries of 100,000 egg capacity and over. Few hatcheries of that size would be able to dispose of their output in their own community.

The survey by Kimball, Moore, and Smith (1945) indicated an average hatchery capacity of 49,900 eggs in 1943. They showed that the number of hatcheries and the egg capacity by size groups, in 1938 and 1943, to be as follows:

Size groups (number of eggs)	Hatcheries		Egg capacity	
	1938	1943	1938	1943
	<i>Number</i>	<i>Number</i>	<i>Thousands</i>	<i>Thousands</i>
Under 10,000.....	2,867	2,199	13,673	11,401
10,000 to 24,999.....	3,023	2,673	48,131	43,238
25,000 to 39,999.....	1,720	1,693	54,108	52,284
40,000 to 59,999.....	1,262	1,353	61,124	65,189
60,000 to 99,999.....	896	1,176	66,826	87,610
100,000 to 199,999.....	541	641	69,816	84,946
200,000 to 499,999.....	182	289	52,905	85,184
500,000 and over.....	40	88	30,793	74,788
All sizes.....	10,531	10,112	397,376	504,640

Types of Hatchery Enterprises.—At the present time there are two main types of organizations engaged in the production of baby chicks. They may be grouped as follows:

1. *Breeder Hatcheries.*—Breeder hatcheries sell primarily quality chicks and get higher than average prices. They have to, otherwise they cannot long remain breeder hatcheries.

The small ones with small capacities often produce all or a large percentage of their eggs on their own breeding farms, usually operated on the same place and in conjunction with the hatcheries. Trapnesting and pedigreeing are carried on in large numbers of cases; in others, careful culling and selection plus the use of good

males is practiced. Where all of the eggs are produced by the breeder on his own farm, the capacity must of necessity be limited when it is figured that 1,000 to 1,200 females are needed for each 10,000 egg capacity. The advertising value of hatching from eggs every one of which is produced on the owner's farm is great.

The larger breeder hatchery maintains a breeding farm where, as a rule, trapnesting and pedigreeing are done. The home flock usually supplies the chicks that go to the flock owners each year. As a rule, all males used are also produced from the home flock and distributed to the other flocks. This type of hatchery usually will run from 20,000 to 150,000 capacity. Under this arrangement, the hatcheryman can maintain very close flock supervision and obtain good results.

2. Non-Breeder Hatcheries.—The great majority of hatcheries maintain no flocks of their own and operate no breeding farms. Their capacities run from a thousand or so up to a million or more. Some of the larger ones have their capacity spread out in several plants or hatcheries, and others have it located all at one place. The egg supply problem increases with the capacity at any one location. With large capacity, eggs are often shipped in by express and parcel post from long distances. Many large hatcheries get their egg supplies partly or wholly from outside communities or even other states. From Ohio west, some people make a practice of buying hatching eggs for hatcheries, but do no hatching themselves.

In this group some carefully cull their flocks and some do not. Where the chick outlet is largely wholesale, the tendency is for less culling because the chicks are sold largely on price, quality being a secondary factor. Some maintain a farm and keep a few chickens on it, but do little if any real breeding or improvement work.

Related Activities.—Because the hatchery business is highly seasonal, hatcherymen soon looked around for other activities to occupy their time and provide an income during the remainder of the year when they did not operate their incubators. In fact, they were partly driven to seek new sources of income. Competition had become increasingly more intense, and chicks were being sold with a much narrower margin of profit than they had been while the industry was still developing.

Today, we find hatcherymen doing a number of things to prolong their season's business, chief of which are:

1. Sale of feed, remedies, supplies and equipment.
2. Buying of market eggs and poultry.
3. Broiler business.
4. Production of started chicks. Both this activity and broiler production are largely the outgrowth of battery brooding.
5. Production of pullets. This activity generally is best suited to a hatchery operated in conjunction with a poultry farm. Although pullets can be started in battery brooders, it is not desirable to grow them out in batteries; so brooder houses and range are practically necessary to produce sturdy, vigorous pullets.

III

ESTABLISHING THE HATCHERY

WHAT CAPITAL is necessary to start a hatchery? Where should I locate? What knowledge and abilities should I possess to make a success in the business of hatching chicks? These are some of the questions that should bob up in the mind of the prospective hatcheryman.

Personal Qualifications.—Hatcherymen have been recruited from the ranks of clerks, barbers, blacksmiths, rural mail carriers, college professors, poultry raisers, farmers, and a range of occupations and professions that would make an almost endless list.

Although requirements for success in the hatchery business may not have been so exacting when many of the most successful operators started their hatcheries as they are today, nevertheless, it goes to show that these individuals have adjusted themselves to the changing conditions in the industry and have survived in the competitive struggle. When the traits and abilities of these successful hatcherymen are analyzed, it will be seen that they have certain qualities in common.

These qualities which make for success in the hatchery business today are:

1. *Poultry Knowledge.*—When the baby chick business was still in its infancy, the majority of hatcheries did a mail order business. As long as a man could produce baby chicks and was a good salesman, he didn't have to know a whole lot about poultry management.

Times have changed. New hatcheries that are established must depend largely on local sales. Fortunate, therefore, is the hatcheryman who knows what to advise when a flock suddenly goes into an unexpected molt, who knows how to make a post-mortem examination of diseased birds for some distressed farmer whose chickens are dying, who can offer suggestions on brooding, and so on. He becomes the "poultry expert" of the community, and as such, he

has a wonderful opportunity to sell not only baby chicks, but feeds, remedies, equipment and supplies.

Many hatcherymen who lack poultry knowledge hire their poultry "experts," but where the hatcheryman has frequent personal contact with poultry raisers, it is certainly an advantage to know something about poultry management. This knowledge can be acquired through diligent study of poultry books, magazines, bulletins and advertising literature coupled with everyday experiences.

2. *Ability to Handle People.*—In his daily work, the hatcheryman comes in contact with chick customers, flock owners who supply the hatching eggs, and others. If he is tactful, has the knack of making friends easily, he will command immeasurable good will in the community, but let him make one false or questionable move, and his reputation will be torn down quickly, and his business will suffer. The man who can't get along with people has no business starting a hatchery.

3. *Selling Ability.*—"We just put a little advertisement in the poultry journals, then the people write us letters and we sent them a circular and the people send us the money for the chicks," M. Uhl of Ohio told Dr. S. B. Smith, the incubator inventor, back in 1902.

Selling chicks isn't so simple today. Competition is keen, and the hatcheryman of today not only must know how to produce husky livable chicks, he must know how to sell them. He must be familiar with various selling methods, know what appeals are most effective, and plan his selling program accordingly.

4. *Managerial Ability.*—The efficient hatchery manager keeps accurate records on all his plant operations, knows exactly how much his chicks should be priced at to bring a reasonable profit, and finds new ways of doing things to cut the corners and keep down costs. To ignore the necessity of complete records in hatchery operation is to invite failure.

5. *Enthusiasm.*—Enthusiasm counts a lot in most successes. Instead of closing up his hatchery and taking both a physical and mental vacation at the close of the hatchery season, the man who is intensely interested in his work reviews his mistakes of the past season, sees where he can adopt different methods, and lays the plans for a more successful season next year. He attends conven-

tions to pick up ideas from Jones and Brown and Smith, and he finds it profitable.

How Large a Start?—The size of the hatchery will be determined by the amount of capital available, number of flocks suitable for supplying hatching eggs, whether or not the hatchery is to be a full time proposition, and so on.

Lowrie (1929) found that the investment for Ohio hatcheries included in the study ranged from \$8,500 for a concern having an output of 109,000 chicks and not owning its building to an investment of nearly \$62,000 for a concern which had an output in excess of 511,000 chicks for the season.



Fig. 8.—This attractive plant is one of the hatcheries operated by the Washington Cooperative Chick Association. The manager's residence is at the right.

Poffenberger and DeVault (1939) found that the average investment was \$5,284.56 for hatcheries with an average output of 109,392 chicks, plus 7,536 chicks custom hatched. The investment was \$5.02 per each 100 chicks hatched.

The main items in hatchery investments are buildings, incubators, automobiles and trucks, hatchery tools and equipment, and office equipment, with incubators usually representing by far the larger share of the fixed equipment investment.

Many of the most successful hatcherymen today started with incubators in the basements of their homes, in garages or in other buildings. As their businesses expanded, they added to their capacity and either rented larger quarters or erected special buildings. The beginning hatcheryman does not necessarily have to buy a new incubator, for there are many good used machines available which

will serve the purpose. Incubator manufacturers, moreover, generally offer good terms with the payments spreading over a period of years.

Because the newcomer in the business has not had a chance to establish credit, he will probably need a cash reserve to take care of payments to flock owners and purchase of supplies. Flock owners do not like to wait for their money.

Where to Start the Hatchery.—Since hatcheries are being successfully operated on farms, in small towns and in cities, it is seldom necessary to change one's present location, unless the type of local hatchery competition is such that location elsewhere is desirable. A local man or woman, however, is generally acquainted with farmers of the community and knows where hatching eggs can be obtained and where chicks can be sold.

One way to learn the possibilities for a hatchery in a community is to make a survey of the poultry raisers to find out how many chicks are purchased and how many are hatched at home. This should cover a radius of 6 to 10 miles. Observe, too, the general interest in poultry. If brooder houses and well-built laying houses are numerous in the community, it is an indication that poultry interest is good. Then, of course, there are the official census figures giving the number of chickens on farms, etc.

The local postmaster should be consulted to learn approximately how many chicks are shipped into the community each year. Since it means additional business for his office to have a local hatchery shipping out chicks, he will likely give this information very willingly. Often, folks who have been buying their chicks by mail will buy their chicks locally if they can get the same variety and quality of chicks.

The Actual Location.—The farmer who starts a hatchery on his own farm cannot do much about the location except to advertise it liberally, so that prospective chick buyers have no difficulty in finding it. Many farm hatcheries, which do a sizable business, maintain a retail chick and poultry supply store in town, keeping it open the year around and selling poultry equipment, remedies, feed, and supplies.

When renting a building in town for the hatchery or the retail store, pick a location that is easy to find, providing the rent is within

reason, for a good location for the hatchery is as important as the location of an A & P store. Another thing to consider is parking space. Unless plenty of parking space is available, it will be difficult for flock owners to deliver their eggs and for customers to drive away with their chicks.

Oftentimes, hatcheries can be located so as to capitalize on nearby landmarks. When a hatchery advertises that it is located "across from the postoffice" or "next to the bridge," it makes it much easier to find.



Fig. 9.—An attractive setting for a farm hatchery building which was a cattle barn before remodeling.

Establishing the Branch Hatchery.—What has been said in the two preceding sections with respect to starting a hatchery applies also in establishing a branch hatchery. It is important to locate the branch hatchery in a town having a good trading area. Some chain operators make it a point to locate only in county seat towns.

Generally, it is best to locate the branches close enough, so that the hatchery chain can dominate certain territories in its local advertising as well as in the chick price situation. Such a plan of locating branches also makes it easier for the chain operator to visit his branch plants quite frequently.

The next thing is to have a good manager. To attract a manager of high calibre, the branch should have a capacity large enough to make it worthwhile for an individual of that type. Philip C. Endres,

Indiana hatchery chain operator, writing in *Hatchery Tribune*, has this to say concerning the selection of a branch manager:

In selecting a manager for a branch, I always try to get a man who is honest, capable, and a hard worker. He must be interested in his work to the extent that he will put his whole self into the work before him, and to create this interest, it is nearly essential that this man be interested financially in the branch hatchery.

• There are, of course, reasons for not wanting the local manager interested in a financial way, but I find that it works out much better to have him part owner, and that way he will conduct the affairs of the firm in a much more business-like way than the average man who is not a part owner. •

Some hatchery chain operators use the same name for all branches. This is an advantage when doing state farm paper or poultry journal advertising. Other chain hatcheries, however, incorporate the town name in the hatchery name to give as much local touch to the business as possible. Further local atmosphere may be secured if the branch manager is a local man and takes an active part in community affairs.

IV

THE HATCHERY PLANT

IN THE PLANNING and arrangement of a hatchery, three principal things must be taken into consideration:

1. Appearances—inside and out.
2. Efficiency of operation of the plant.
3. Convenience of customers.

Many hatcheries rent the buildings in which they are located, consequently, they are limited as to what they can do in making desirable changes and improvements. In this chapter we have outlined some of the features in layout and design that contribute to efficient operation of the hatchery, not that many hatcheries can carry all of them out, but that they will offer some suggestions as to changes that can profitably be made in established plants and furnish some ideas and principles to those planning to construct a new hatchery building.

Hatchery Surroundings.—The grounds around the plant should be made as attractive as possible. People are apt to associate the quality of chicks produced with the appearance of the buildings and environment. Things can look too gaudy and expensive as well as too shabby. The grounds should convey the idea of neatness, orderliness, cleanliness, and efficiency. With but very little expense, a little landscaping and planting will accomplish a great deal. Concerns selling shrubbery will gladly draw up plans free of charge, as a rule. The lawns should be well kept. Many hatcherymen make a hobby of keeping the grounds in good condition, some even planting flower gardens.

One necessary requisite should be easy access to the hatchery with plenty of parking space for automobiles. On hatching days and egg receiving days, there will be a lot of confusion if there is not some system for people to get in and out of the hatchery. Good



Fig. 10.—Landscaping and planting will accomplish a great deal in making the hatchery surroundings attractive. (*Hatchery Tribune*.)



Fig. 11—This neat hatchery is identified by an attractive neon sign. Plenty of parking space is available in front of the building.

parking space is almost necessary these days, and as local business increases, it becomes more important. If located on a main street, nothing much can be done unless a special parking space is rented for patrons.

Driveways should be provided to facilitate loading and unloading feed and supplies, receiving eggs, loading chicks, etc. These jobs should be carried on without disturbing the customers.

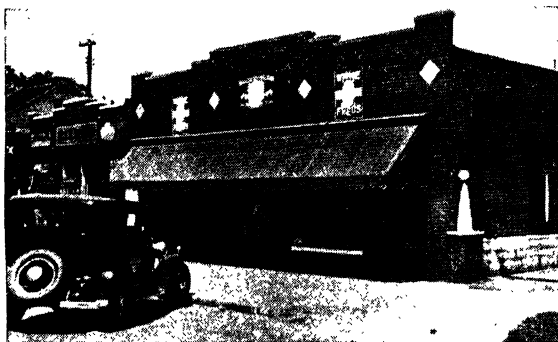


Fig. 12.—An attractive store front is an asset to the hatchery selling feed and poultry supplies. (*Poultry Supply Dealer.*)

A good sign should be erected so people can easily find the hatchery. This sign can be placed on the building, or in a conspicuous place in front of the building and will serve as a good advertisement if properly and neatly painted.

The Hatchery Building.—The material used in the hatchery building is of little consequence and will vary with the locality, the cost being the determining factor. The building should be attractive in appearance and of such construction to maintain uniform inside temperature, which is very important. Tile and concrete blocks are both popular. Where wood construction is used, double walling and the use of insulation is advisable to insure more uniform temperature.

Floors and walls should be of such construction that they can be easily washed and painted. Tile walls can be flushed with a water hose. Concrete floors with drains are most desirable because they

can be cleaned by flushing which requires a minimum of labor. Wood floors are hard to keep clean, require more labor, and are not as sanitary. To prevent water from running beneath the incubators, it is well to construct the concrete floor so that the machines may be placed on bases that are 2 or 3 inches above the rest of the floor.

INSIDE ARRANGEMENT

In planning the inside arrangement, the points outlined in the first paragraph of this chapter must be given careful thought. It is best, in so far as is possible, to have the different operations in separate rooms. This enables a more systematic carrying on of the various jobs, permits better sanitation, and more efficient work. In smaller hatcheries, where one or two persons do all the work, this is not always possible, but in larger plants it is. If everything is done in one room, customers constantly disrupt the entire organization. Also, for best results, different amounts of ventilation and different temperatures are needed.



Fig. 13.—A well-equipped office for the hatchery or breeding farm is essential for proper handling of orders and for maintaining good business records.
(*J. O. Coombs & Son.*)

HATCHERY MANAGEMENT

Some or all of the following rooms will be found desirable.

Office.—Every hatchery of any size, of course, needs an office where the manager keeps his records, carries on correspondence, keeps books, etc. Quite often in large hatcheries where a large amount of addressing and mailing is done, an extra room is provided

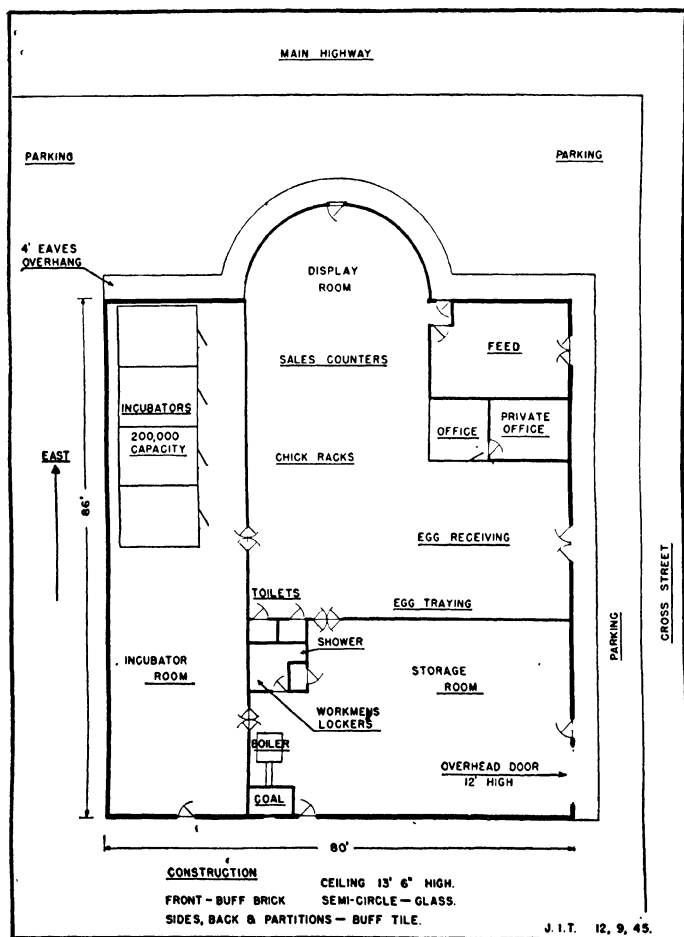


Fig. 14.—Suggested hatchery floor plan. (*Hatchery Tribune.*)

on the second floor or some other place where the people doing the addressing will not be interrupted and their attention diverted by people coming and going.

The manager often has a private office to which he can retire when he has jobs that require concentration and freedom from interruption. The main part of the office, however, should be in the front of the building where everyone coming and going can be seen. As customers enter, someone should be on the job to greet them, and since the manager usually does this, the office should be near the entrance door. In other words, the office is the eyes and brains of the organization, and it should be so located as to see that everything is carried out properly and that all customers are promptly waited on.

Display Room.—Close to the office, there should be a convenient display room where all the different things the hatchery has for sale can adequately be displayed and where the patrons can carefully examine them. This display room should be close to the office, so that the manager can readily see any customers who might be interested, and where people who are waiting can look over the displays rather than just stand or sit doing nothing while waiting. This room should also provide window display space, which can be made a valuable help in local sales efforts.

Incubator Room.—The incubator room should be a separate room if at all possible for the following reasons:

1. To prevent people who come into hatchery from walking where the incubators are and possibly carrying disease infection of some kind.

2. To prevent continuous opening of the machines to let people look in. It makes uniform regulation difficult if the incubators are constantly opened and closed.

3. To keep the room at a more uniform temperature and humidity so that it is easier to run the incubators uniformly.

4. To prevent constant interruption of the employees and provide more efficient work by keeping out visitors. •

5. To prevent piling up of supplies, egg cases, feed, etc., which make constant and careful cleaning impractical and virtually impossible.

To avoid any possible suspicion, however, that everything is not open to inspection, glass partitions should be provided so that people

can look in at any time and see all the operations. If signs are posted stating that the hatchery room is closed because of sanitation measures, people will be satisfied.

The exact location and arrangement of the machines will depend on the type of incubators and to some extent the capacity. Cabinet machines are usually placed along the walls and face the center.

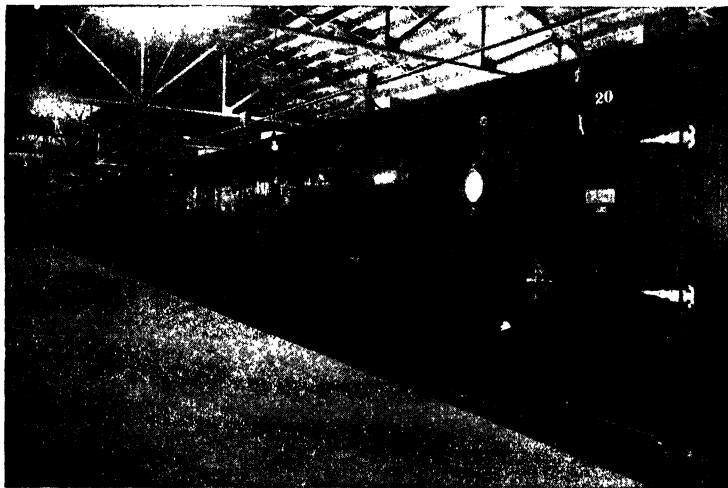


Fig. 15.—Incubator room of a large modern hatchery.

Space enough is left back of the machines to get behind them. However with certain types of incubators they are placed in rows since eggs are set from both sides. Sufficient space must be allowed between the rows of incubators, so as not to be crowded when working. The incubator companies give full directions regarding such points.

Chick Sorting and Shipping Room.—Close to the incubator room, there should be a room where the chicks are sorted, counted, and prepared for shipment. Also, in this room chicks are held for local customers until called for or delivered. As the chicks are removed from the incubators, they are taken to this room to be sorted, the orders filled, boxes tied and labeled, etc. Benches with adequate light should be provided for sorting and counting, and racks for holding chicks until called for, shipped, or delivered. Arrangements

for loading directly into the trucks for delivery to the postoffice or to customers will reduce labor and confusion.

While chicks are being sorted, the temperature should be sufficiently warm to prevent chilling. A separate room enables this to be accomplished by means of separate temperature control and by not allowing the doors to be continually opened. It should also be handy to the office, so that people wanting to see chicks or coming in for their chicks can be waited on by the manager without having to walk a long ways and without having to go in and out of several different rooms.

This room can, if necessary, be used for egg receiving and traying since the eggs are received, trayed and put in the incubators before chicks are taken off as a rule. From a sanitation point of view, however, this is not the best practice.

Egg Receiving and Traying Room.—A special room in which to receive eggs from flock owners is desirable. It is just as well if these eggs are received at a different place than where chick customers enter, in order to avoid confusion. With small hatcheries, eggs must be received and trayed where customers can be seen, since the same person does all the work. In larger hatcheries, extra help is used for traying, and these workers should be located where they will not be disturbed by other things going on in the hatchery. With a separate room, the eggs are usually received and trayed in the same room.

This room should be large enough to store the eggs and still provide space for the traying and holding in racks after being trayed. Suitable benches with good light are needed for efficient traying, the exact type of construction varying with the type of trays used. It is most important that good lights be provided, preferably fluorescent lights with good reflectors, so that tints in white eggs can be distinguished on dark days or at night. This room should also be close to the incubator room, so the egg racks can be quickly and easily rolled or carried to the incubators for loading. As mentioned before, the chick sorting room can be used for this purpose if space is limited.

Boiler and Cleaning Room.—A special room is needed for the boiler or boilers which heat the building and incubators if steam heated incubators are used. This room should be at the rear of the building and out of sight as far as possible. To reduce fire hazards,

it is desirable to have the boiler room separated from the rest of the hatchery building by a heavy brick wall and a fire door. With proper washing, cleaning, and disinfecting equipment, this room can also be used for cleaning and disinfecting trays after the hatch.

A tool room will be needed, and this room can also be used for this purpose. It should be so constructed and arranged that it can be thoroughly flushed and all debris quickly and easily removed following hatching days.

Toilet and Shower.—A toilet is a necessity for employees and very desirable for customers. Many hatcherymen have installed a shower bath for the help, particularly where it is necessary to work inside the machines and chick down is blown all through the clothes and all over the body.

An extra room is also desirable. There is never too much room around a hatchery.

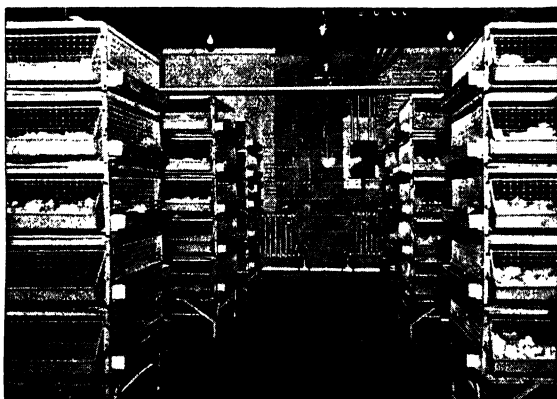


Fig. 16.—View of battery brooder room in which temperature and humidity are automatically controlled. (George M. Anthony.)

Brooder Room.—All of the rooms so far discussed are recommended as being in the same building and on the same floor. The brooder room is considered a necessary requisite by many hatcherymen. It is desirable as a place to hold surplus chicks and brood them to be sold as started chicks at the ages of one, two and three weeks.

This brooder, however, should not be in the same room as the incubators, nor very close to them, as a matter of sanitation and dis-

ease prevention. Any hatcheryman who has been through an infection of infectious bronchitis is pretty well convinced of this fact. Infected chicks in the brooder apparently infect chicks in the incubator or just after they are out of the incubator, and it is a calamity for a hatcheryman to have nearly every bunch of chicks that he sells go bad as a result of infection from the chicks in the brooder.

For this reason, it is most desirable that the brooder be in a separate building if at all possible. In most cases, this is impractical. The next best thing is to have it on a different floor, which usually means the second floor, so that the possibility of infection to newly hatched chicks is as small as possible.

This brooder should not be too far away from the office if the brooder chicks are to be sold. People must be shown the chicks, and here lies a possible danger of carrying infection to the brooder room. Many people shop around for chicks and by going to several hatcheries, walking around in the brooder rooms and handling the chicks, they are quite apt to carry the infection. Some hatcheries feel they must take people in their brooders and run these risks. Others allow no customers in their brooders, but provide a special glassed in display shelf where chicks of the desired age and quality are brought by the caretaker of the brooder. The customer can carefully look over the chicks, but is not permitted to handle them. Hatcherymen following this system report that as long as signs explaining the situation are posted, people do not seem to resent this precaution and that it does not hurt sales. Some even say that the precautions impress people and that it actually helps.

The floor should be such that it can be flushed with a hose regularly and kept moist. The temperature control should be reliable and adequate ventilation provided for ample fresh air and to keep the temperature down during hot weather.

Storage.—Every hatchery needs plenty of storage space for feed, equipment, chick boxes, etc. This storage, however, should not be permitted to take up valuable space required for displays, incubators, office, etc. However, it should be handy so that orders for feed and equipment can be quickly filled. People do not like to wait until someone handles everything in the building to find what he wants. Material should be stored in an orderly fashion, so that it can be quickly and easily found and removed.

Ordinarily, the second floor makes the best storage place. It is under the same roof and can be made very handy. Chick boxes can be made up on the second floor and dropped down to the sorting and shipping room through a chute. A lot of other material can be handled in this same manner from the second floor.

VENTILATION

Ventilation is necessary to (1) provide fresh air and remove the stale air, and (2) to help regulate temperature particularly during the late season.

How to Ventilate.—Adequate ventilation can be secured through the windows in most any part of the hatchery with the possible exception of the incubator and brooder rooms, where, under certain

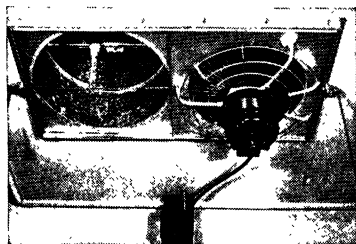


Fig. 17.—A combination gravity and electric fan ventilation unit for hatcheries and battery brooder rooms. The fan is used only when more rapid ventilation is desired.

conditions, special ventilators may be advisable or necessary. When sectional machines are used, the amount of air present is so great in relation to the number of eggs that there is usually little to worry about except to keep the temperatures down in hot weather.

Just how much air is needed in an incubator room will vary with a great many factors, and even under certain set conditions, it is doubtful if anyone knows exactly. So the safe procedure is to provide plenty. With high ceilings, there is no reason why windows cannot be used as outlets, but they should not be even with the tops of the incubators, because if the wind blows in, it often results in

back drafts in the incubators and consequent ventilation and temperature troubles.

It is preferable to have the windows above the tops of the incubators and arranged to open at the top, so the air will be forced against the ceiling first. It is also desirable to have windows on more than one side of the room, preferably on opposite sides, so they can be adjusted according to the direction of the wind. All windows should be easily opened and closed. If they don't work easily, they are not apt to be adjusted. Air will also come in these windows and will leak in a great many other places. Other windows opened slightly at the bottom will also serve as inlets.

If ventilation is not through the windows, ventilators should be installed. Where properly installed, and when they are more or less automatic, there is no question that ventilation is made easier, but where they are not automatic and cannot be adjusted, they are often no better than windows if as good. If the incubators are fumigated and the incubator outlets empty into the room, ventilators with fans installed to hasten the air change are almost necessary.

In the brooder room, the same principles apply. Ventilation can be secured by means of windows, but ventilators often simplify the problem.

One of the greatest values of ventilation is to help keep the temperatures down late in the season when it is hot. This is true for both incubator and brooder rooms and is accomplished by the use of moisture and rapid movement of air resulting in evaporation of the moisture which in turn helps to keep the temperature down. To facilitate this process, fans are placed in the windows or ventilator shafts to move the air faster. Even in cooler weather, these fans are often used to insure sufficient air change.

HEATING AND TEMPERATURE CONTROL

Uniform temperature is very important in the incubator rooms and any place where chicks are kept. Incubator rooms should be kept as near 70° F. to 75° F. as possible. Brooder rooms vary according to the age of chicks. Tight buildings of good construction and well insulated simplify the temperature control problem, because outside changes affect inside temperatures to a less extent.

Methods of Heating.—Uniform temperature obviously means the use of heat early in the season. Small hatcheries generally have a stove, and where used, it should be surrounded with a metal jacket open at the top and bottom to insure better distribution of the heat. In large hatcheries, steam or hot water plants are used. These should be so constructed that each room can be separately and automatically controlled at whatever temperature desired. For instance, the brooder room for day old chicks should be warmer than the office and incubator rooms. The sorting and shipping room will need to be slightly warmer than most of the other rooms also. If not automatic, it should be so planned that each room can be regulated by hand controls.

Late in the season the problem is that of keeping the inside temperature down. This is accomplished by means of good construction to keep out the heat from the sun on the roof and walls, and by means of rapid ventilation.

Light.—Plenty of window space should be provided wherever light is desired as in the display room, office, sorting and shipping room, etc.

Where night work is done, adequate lights, preferably fluorescent lights, are necessary. Most hatcheries are very poorly lighted for night business. Displays are useless if they cannot be seen. The window displays should be brightly lighted. In the brooder rooms, subdued or colored lights are often used because this is generally supposed to reduce the amount of cannibalism.

Fire Protection.—There is always danger of fire around a hatchery and every precaution should be taken. The insurance is rarely enough to cover all losses. Chemical fire extinguishers are easily obtained and can be so distributed as to be immediately available. Hose connections can also be arranged, so any part of the building can be reached. Tile and concrete block construction are preferred, partly because the fire hazard is less.

EQUIPPING THE HATCHERY

THE IMPORTANCE of having an incubator that will turn out a high percentage hatch of chicks that are strong and sturdy cannot be over-emphasized. No matter how good a hatcheryman's flocks are, or how many customers are ready to buy the chicks, his profits will depend upon whether or not he is able to get high percentage hatches and turn out chicks that will live in the hands of his customers.

Fortunately, today there are a number of mammoth incubator manufacturers that have become well established, and the man contemplating the purchase of an incubator should not have any difficulty selecting a machine that will give a maximum amount of satisfaction. Incubator firms are usually willing to offer good terms on both new and used machines.

Types of Incubators.—At the present time, there are three types of mammoth incubators available to hatcherymen. They are the sectional incubator, the cabinet incubator, and a combination of the two.

The *sectional* type of incubator is really a modification of the small, lamp-type incubator. It consists of a series of incubation com-

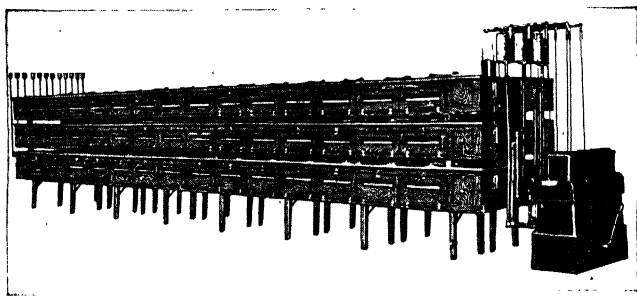


Fig. 18.—A three-deck sectional type of incubator no longer made. The operator could start with one 600-egg unit and add sections to obtain a machine with a capacity as high as 36,000 eggs.

partments, each of which has an individual heat regulator, with heat coming from a central heating system in which coal, oil or gas is the source of heat. No electricity is required for its operation.

Sectional incubators are so designed that one section may be placed above another to form either a two, three or four deck machine as desired. Ventilation is secured by the natural circulation of air. Heat is supplied to the eggs by radiation from hot water pipes in the upper part of the egg chamber.

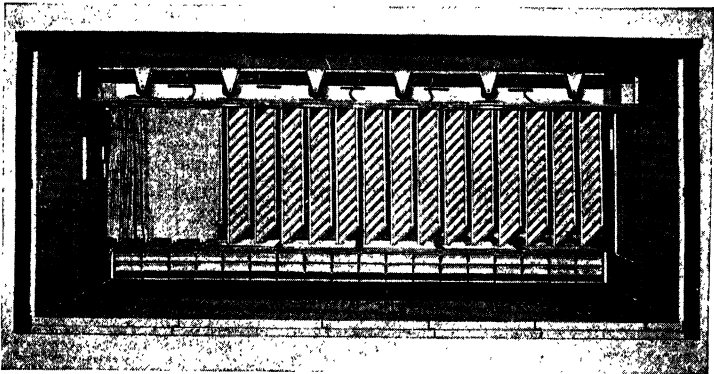


Fig. 19.—Cross section of a cabinet incubator of the forced draft type. The operator works inside the incubator in setting the eggs or taking off the hatches. Eggs are turned by a hydraulic mechanism. (*Smith Incubator Co.*)

The chief advantage of sectional machines lies in the fact that more sections can be added to the one heating unit as the operator's business expands. Because each compartment of eggs is isolated from all others, the danger of the spread of infection from one compartment to another is reduced, but not absolutely eliminated. A further advantage of sectional machines is the fact that they require no electricity for operation, making it possible to operate a sectional incubator in rural districts when no electric power is available.

Against these advantages, however, is the objection that sectional incubators take up a rather large amount of floor space for their capacity. Furthermore, uniformity of temperature in all hatching compartments is difficult to obtain. The work of regulating the temperature in the individual compartments, the taking off of the

hatches, and the cleaning of the compartments after the hatch is over, all add to the labor requirements.

The *cabinet* or *room type* of incubator, so termed because of its appearance, is very compact in size and will accommodate a large number of eggs in a surprisingly small space. Eggs are placed in

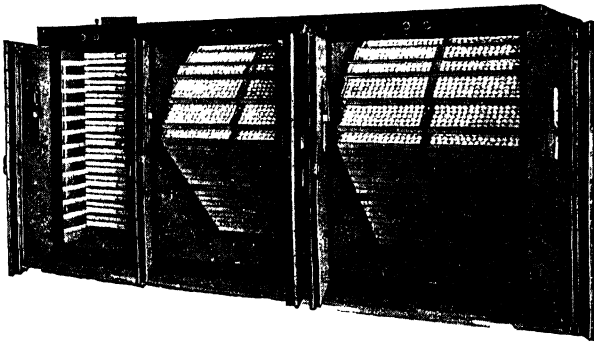


Fig. 20.—A cabinet incubator of the agitated air type with the hatching compartment at the left completely separated from the two incubation chambers. (*Robbins Incubator Co.*)

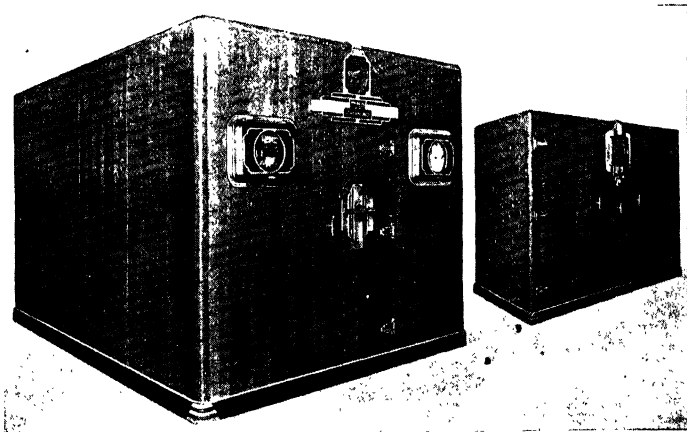


Fig. 21.—The incubation unit at the left has a capacity of 56,000 eggs. Its companion separate hatcher is shown at the right. (*Buckeye Incubator Co.*)

trays arranged in tiers one above the other. The source of heat is usually coal, oil, gas or electricity.

In some of the cabinet machines, the warm air is circulated by means of electric fans, and these machines are said to operate on the "forced draft" principle. In other cabinet machines, however, the heated air is circulated by means of gently revolving paddle wheels or agitators. Usually, cabinet-type machines are equipped with at least one temperature control unit and vaporizer. Some are equipped

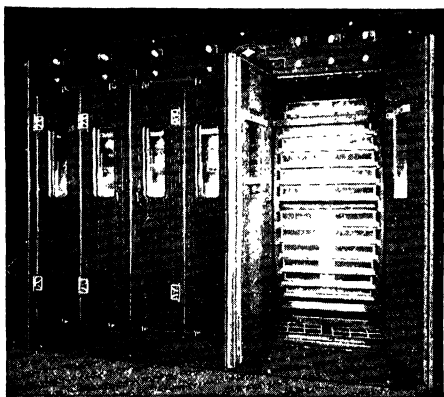


Fig. 22.—A 20,000-egg incubator-hatcher with the doors of the separate hatching compartment open. Even distribution of the heat in both the incubation and hatching chambers is obtained by means of air-stirring blades which move slowly around the egg drum. (*The Petersime Incubator Company.*)

with a supplementary temperature control device. In some makes of cabinet incubators, the operator works inside the machine. In other incubators, the operator works from the outside in setting the machine and taking off the hatches.

The trend since the thirties has been to manufacture incubators intended only for incubation of eggs up to the 18th day. After that, the eggs are transferred to a separate hatcher, which may be simply a separate compartment isolated or shut off from the rest of the incubator, or it may be an entirely separate cabinet in which the chicks are hatched.

The principal advantages claimed for separate hatchers are better control of temperature and humidity at hatching time, greater sanitation through keeping chick down and filth concentrated in one place instead of spreading to the egg chamber, and a much easier cleaning job after each hatch.



Fig. 23.—An incubator-hatcher with the separate sanitary hatcher open. Note the special pedigree hatching tray. (Bundy Incubator Co.)

In the *combination cabinet-sectional* incubator, the incubation of the eggs to the 18th day is done in the cabinet portion of the machine, then the eggs are transferred to the hatching compartments, holding one or more trays and with individual temperature control as in a sectional incubator. Naturally, this machine will have some of the advantages and disadvantages of the types of incubators previously described.

Buying Incubators.—In purchasing an incubator, the first step should be to write for a number of catalogs in order to study the models offered by different manufacturers. They may send a repre-

sentative who will present the arguments of the models that he has to sell. Final selection of a machine should, however, be based upon a careful consideration of the following points and features, without placing undue emphasis on any one point, of the different machines:

1. *Construction and insulation of cabinet.*
2. *Ease of turning eggs.*
3. *Positive temperature and humidity control.*
4. *Adequate ventilation.*
5. *Ease of cleaning after hatch.*

6. *Possibilities of disease spread.* It has been definitely shown that pullorum disease (bacillary white diarrhea) is spread by the circulation of chick down carrying the germs. What provision has been made to control the spread of disease?

7. *Source of heat.* Most incubators are heated by electricity, but some of the older incubators are heated with steam or hot water.

8. *Economy of operation.* Seitz and Hillman (1931) reported that the energy consumption per hatch ranged from 20 to 180 kilowatt hours per 1,000 egg capacity, running higher per unit on the

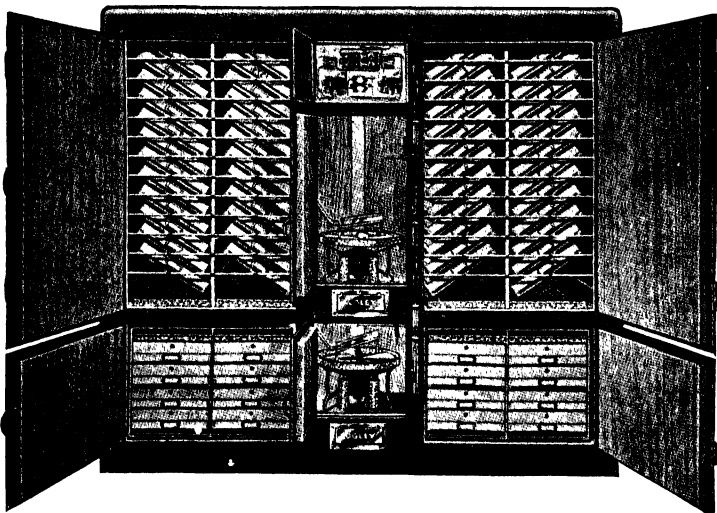


Fig. 24.—An incubator-hatcher with the hatching trays located below. There are cooling coils in the hatching compartment for emergency use. (Cugley Incubator Co.)

small machines, and depending upon the insulation of the machine and the temperature of the room. In considering cost of operation, various labor saving devices should be given consideration also.

9. *Large capacity for amount of space displaced.* . . .

10. *Adaptability to building.* When old buildings are used for the hatchery, certain makes of machines may be unsatisfactory due to size, shape, and height.

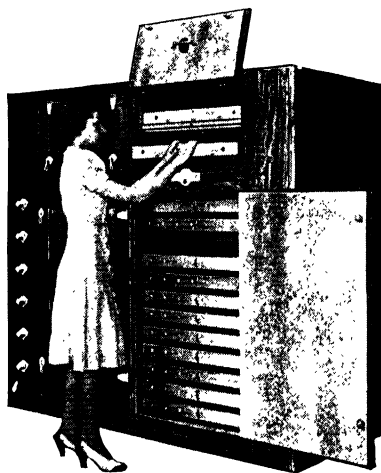


Fig. 25.—This incubator has its incubation chamber below with the smaller hatching compartment above. The egg trays do not shift, but the eggs are turned by means of automatic turning devices in the trays. (*James Mfg. Co.*)

11. *Service facilities offered by manufacturer.*

12. *Resale value of machine.* Well established makes usually have a much higher resale value than machines not so well known.

13. *Reasonable cost per egg.* The cost of different makes of incubators may be compared by dividing the price of the machine by the total egg capacity. This will give the cost per egg. Machines with a small capacity usually will be found to have a higher cost per egg than larger models of the same make.

Other points will, no doubt, occur to the prospective buyer as he studies the various makes of incubators, but with a careful consider-

ation of the 13 foregoing points and with sufficient discount for the enthusiasm of incubator salesmen, he should be able to make a wise selection.

Rental of Incubators.—Sometimes it is possible for the newcomer in the hatchery business to locate some idle incubators and rent them. A fair yearly rental on an incubator should equal 6 per cent on the investment plus 10 per cent depreciation. Thus, the owner is justified in asking a rental of \$80, or \$30 interest on a \$500 investment plus \$50 for depreciation. If the owner of the idle machines considers them more or less of a loss, he may be willing to offer more favorable terms to the renter.

Hatchery Equipment.—The hatcheryman will soon find that he will need other equipment for smooth and efficient operation of his plant. Among the things that he will find a need for are egg candlers, specially constructed benches or tables for traying eggs, movable racks for holding the trayed eggs just prior to placing them in the incubator, tables for counting and sorting chicks before boxing, racks for holding the boxed chicks, tray cleaners, and possibly a box stapler and a wire tying machine. These pieces of equipment will be given further description in the chapters where their use is explained.

Office Equipment.—Customers are valuable assets and their good will must be carefully guarded. Only too often their business is lost because the hatcheryman has slipped up in his records somewhere, perhaps due to the fact that he does not have the proper equipment for his office.

First of all, there should be a typewriter to be used in all correspondence. Filing cases will be needed for letters, orders, customer and prospect lists, hatchery records, etc. This appears to be the most essential office equipment.

Many hatcheries, however, have installed addressing machinery and have found it to be a real time saver. An order register that makes it possible to get several copies of an order is another very helpful office machine. Hatcheries doing a great deal of direct mail advertising find it profitable to reproduce their letters with duplicator or multigraph machines. Envelope sealers, postage scales and check writing machines are other pieces of equipment often found in the well organized hatchery.

Dictaphones are not uncommon in the offices of larger hatcheries. Some hatchery operators like to keep in close touch with production activities in the hatchery during the day and, therefore, are not in the office very much. By dictating the letters after office hours, the stenographer can go right ahead transcribing them when she arrives at work in the morning.

Cut filing cabinets are useful in many hatchery offices. Engravings that are used in catalogs and advertising matter represent a rather large investment, and the best way to protect them against damage and possible loss is to file them in a special cabinet.

Retail Store Equipment.—If feed and supplies are to be handled, the hatcheryman will probably have use for a cash register, counters, shelves, racks for displaying poultry equipment, and so on. This equipment will be discussed further in the chapter on selling feed and supplies.

VI

THE EGG SUPPLY

SINCE THE MAJORITY of hatcheries buy their hatching eggs instead of producing them, the problem of securing satisfactory sources is a big one.

Hatching eggs cannot be improved after they are produced. All the hatchery can do by proper incubation is to get the best out of the eggs, but it cannot make good chicks out of poor eggs. Consequently, the hatchery must of necessity have an interest in the flocks producing its hatching eggs. If they are given improper care, the eggs will hatch poorly, and this naturally increases the cost of production and reduces profits.

Furthermore, if the chicks are not of high quality, replacements will be greater, repeat business will be lost, and the hatchery's reputation gradually impaired, forcing it to sell at lower and lower prices. It would seem, therefore, that the hatchery cannot afford to be without a reliable source of good hatching eggs. To get flock owners who will supply desirable hatching eggs and carry out an improvement program is no small job.

Number of Flocks and Breeders Needed.—The number of flocks needed will vary a great deal according to a number of factors. It is virtually impossible to have sufficient flocks to supply all the eggs needed early without having too many later in the season when the flocks are in much heavier production. The more custom hatching done, the fewer breeders needed. For the ordinary hatchery, it will be found that from 1,000 to 1,200 females will be needed for each 10,000 egg capacity.

In the case of Leghorns, this will generally mean fewer flocks, because Leghorn flocks average larger than those of the heavier breeds. For instance, strictly Leghorn hatcheries of 150,000 egg incubator capacity may need only 30 flocks, while the hatchery specializing in heavy breeds may need over 100 flocks. In New Eng-

land where the heavies predominate in commercial flocks, this would not be true.

TABLE III.—NUMBER OF FEMALES AND MALES REQUIRED FOR VARIOUS HATCHING CAPACITIES ¹

No. of Females	No. of Males	40% Av. Egg Prod.		50% Av. Egg Prod.		60% Av. Egg Prod.	
		Eggs per Week	Eggs 21 days Incubator Cap.	Eggs per Week	Eggs 21 days or Inc. Cap.	Eggs per Week	Eggs 21 days or Inc. Cap.
1,000	Leg. 50	2,800	8,400	3,500	10,500	4,200	12,600
	Heavy 67						
2,000	Leg. 100	5,600	16,800	7,000	21,000	8,400	25,200
	Heavy 134						
3,000	Leg. 150	8,400	25,200	10,500	31,500	12,600	37,800
	Heavy 200						
4,000	Leg. 200	11,200	33,600	14,000	42,000	16,800	50,400
	Heavy 267						
5,000	Leg. 250	14,000	42,000	17,500	52,500	21,000	63,000
	Heavy 333						

¹ In actual practice the average egg production is low early in the season and high later. In order to get sufficient eggs for February settings (March chicks), more females are needed than can be fully used later. So as a rule most hatcheries plan on about 1,200 females for each 10,000 incubator capacity, figuring on dropping the poorest hatching ones or limiting each flock owner later in the season when egg production is at the peak and more are being produced than can be set.

In figuring on the number of male birds needed for flock matings, considerable variation can be allowed. With Leghorns and other small active breeds, figure one male to 20 to 30 females; with breeds

such as Rocks, Reds, and Wyandottes, one male to 12 to 15 females; and with Brahmas, Giants, and other heavy breeds, one male to 10 to 15 females. There can be too many males as well as too few; the tendency is probably to have more than is necessary. The possibility of losing some during the winter should, however, be kept in mind.

TABLE IV.—THE OUTPUT OF CHICKS PER MALE AND PER FEMALE FOR HATCHING SEASONS OF VARIOUS LENGTHS AND FOR VARIOUS PERCENTAGES OF HATCH

Leghorns—(Assuming 1 male and 20 females, and 50 Per Cent Production of Good Hatching Eggs as an Average for the Period).¹

Length of Hatching Period	No. Good Hatching Eggs	50% Hatch			60% Hatch			70% Hatch		
		No. Chicks	Chicks Per Female	Chicks Per Male	No. Chicks	Chicks Per Female	Chicks Per Male	No. Chicks	Chicks Per Female	Chicks Per Male
120 Days	1,200	600	30	600	720	36	720	840	42	840
90 Days	900	450	23	450	540	27	540	630	32	630
75 Days	750	375	19	375	450	23	450	525	26	525
60 Days	600	300	15	300	360	18	360	420	21	420
45 Days	450	225	11	225	270	14	270	315	16	315

Heavy Breeds—(Assuming 1 Male and 15 Females, and 50 Per Cent Production of Good Hatching Eggs as an Average for the Period).¹

Length of Hatching Period	No. Good Hatching Eggs	50% Hatch			60% Hatch			70% Hatch		
		No. Chicks	Chicks Per Female	Chicks Per Male	No. Chicks	Chicks Per Female	Chicks Per Male	No. Chicks	Chicks Per Female	Chicks Per Male
120 Days	900	450	30	450	540	36	540	630	42	630
90 Days	675	338	23	338	405	27	405	473	32	473
75 Days	563	282	19	282	338	23	338	394	26	394
60 Days	450	225	15	225	270	18	270	315	21	315
45 Days	338	169	11	169	203	14	203	237	16	237

¹ If egg production runs high and the egg size is exceptional, a higher than 50% yield of good hatching eggs may be obtained. In all probability the output of good hatching eggs will run some higher from Leghorns than from heavies. The output in heavies is quite apt to be cut during April and May because of broodiness. Furthermore, the number of females to each male may vary and this, of course, will cause variations in the output of chicks per male. When the hatching season extends over a longer period, meaning earlier in the spring and later in the summer, the egg production and hatchability are both apt to be lower than during March, April and May.

TABLE V.—NUMBER OF CHICKS PRODUCED PER 1,000 EGG INCUBATOR CAPACITY¹
(Assuming full settings for time indicated)

Length of Hatching Period	50 Per Cent Hatches	60 Per Cent Hatches	70 Per Cent Hatches	80 Per Cent Hatches
126 Days, or 4 months	3,000	3,600	4,200	4,800
84 days, or 2½ months	2,000	2,400	2,800	3,200
63 days, 2 months	1,500	1,800	2,100	2,400
42 days, 1½ months	1,000	1,200	1,400	1,600

¹ Actually, of course, what generally happens is that partial settings occur at both ends of the season and only full settings during late March, April, and May. The output per 1,000 egg capacity will vary from 1,000 or 1,500 chicks in poor seasons up to as high as 6,000 or 7,000 in good years where hatching is done all year or most of the year.

Most hatcherymen feel that with six Leghorn and eight heavy breed males to each 100 females, adequate protection is provided.

Securing Flocks.—The best way to secure good flocks is from the customers who have bought good chicks from the hatchery. As a rule, the hatcheryman knows which customers will make desirable flock owners. He knows which make a practice of raising and maintaining flocks that will be desirable additions to the list of flocks. Those known to be hard to get along with and who are not likely to cooperate with the hatchery in a program of improvement, should not be considered. Such people will be constant sources of trouble and discord.

In starting new in a community, the best procedure is to get a list of a few good poultrymen, possibly from the county agents or feed dealers, and call on these people. From these it is often possible to get the names of others who might be interested in selling eggs and who might have good flocks. A prospect list, at least, can be obtained in this manner after which each can be called on in person to find out the quality of the flocks and the character of the owners. It may be necessary when starting in a strange community to advertise in the local papers in order to get a prospect list to call on. This is not desirable, however, except as a last resort, for it is apt to leave the impression with the public that little care is used in selecting flocks.

Very large hatcheries which require greater quantities of eggs can-

not, as a rule, be as selective in either flocks or flock owners as smaller hatcheries. They are apt to have less supervision and less contact with their flock owners, but this will depend a great deal on the policies of the individual hatcheries. Some large hatcheries make it a policy to maintain close contact and close supervision of their



Fig. 26.—A hatchery must have a reliable source of good hatching eggs. (*Ohio Poultry Improvement Association.*)

flocks and flock owners. Many large hatcheries maintain buying stations at distant points and generally hire someone who has some other business to receive hatching eggs on certain days. These eggs are then shipped to the hatcheries or collected by hatchery trucks.

Hatching Egg Dealers.—In some areas where hatcheries are unable to find suitable local supplies, it is necessary for them to get their hatching eggs elsewhere. To meet this demand, certain individuals and concerns have made a business of supplying eggs to hatcheries. Most of them are located in the Midwest where there are larger supplies of eggs. Quite a few poultrymen in New England have built extensive businesses supplying eggs to hatcheries in Delmarva and elsewhere. Many hatcheries with a limited hatching

capacity, but with extra flocks available, make a practice of supplying eggs to hatcheries in localities where supplies are not ample.

Many of these dealers have developed a large business of this kind and a few even run regular hatching egg truck routes to distant states. Most of these eggs, however, are shipped by express. Many eastern and southern hatcheries buy practically all of their hatching eggs from concerns of this kind.

Naturally, these hatching egg dealers vary in the quality of their output. Some of them are as careful as most hatcheries in the care with which they select, cull, and test their flocks for pullorum disease. Others simply go out and gather eggs from any flocks that appear to be purebred, and when the demand is heavy, nearly any kind of an egg passes as a hatching egg.

In buying eggs from hatching egg dealers, it is most important to know the individual or concern from whom they are being purchased and what care is used in selecting and supervising the flocks producing the eggs. Under ordinary circumstances, it is not as satisfactory to buy hatching eggs from dealers as it is to have flocks producing them under the direct supervision of the hatchery.

Agreements with Flock Owners.—In years past when hatcheries could sell all the chicks they could hatch all season, they had contracts with flock owners agreeing to take all the eggs the flock owners produced between certain dates, say, February 1 and May 15. These contracts specified that the eggs were to be of certain size, that the flock was to be kept healthy, and that a certain premium was to be paid. A few such contracts exist today, but they are fast disappearing.

Today no hatchery can hope to live up to such a contract, because if it cannot sell the chicks, it cannot take the eggs. Flock owners should have it explained that a hatchery can take eggs only so long as it can sell the chicks and no longer. Consequently, agreements and not contracts are now in general use. The hatchery agrees to take the eggs as long as it can at a certain premium, the premium often varying according to the season. The flock owners in turn agree to do certain things such as:

1. Supply eggs of a certain size.
2. Feed a good ration.

3. Not to sell hatching eggs to other people or other hatcheries.
4. Keep their flock environment clean and sanitary.
5. Permit the flock to be tested for pullorum disease.
6. Allow approval by the hatchery of the source of males.

Most hatcheries have certain other rules or understandings which are usually unwritten, such as insisting that the flock owners buy their chicks, or have their eggs custom hatched, at the hatchery. Chicks may be secured other places if the hatchery approves; in fact, many hatcheries encourage this if better stock is secured.

The problem of getting sufficient eggs early and not have too many later is solved occasionally by adopting the practice of determining the number accepted during the flush of the season by the number delivered early. The more delivered early, the more accepted later. This rewards the better flock owners and penalizes the poorer. Also, it means more eggs from the better flock owners and fewer from the poorer ones. The general plan, however, when too many eggs are coming in, is to cut off the poorest hatching flocks first, or else cut each flock owner down a certain percentage.

A binding contract is of little value, since very rarely does either party expect to force the issue in case of violations. What happens in practice is that the flock owner quits, or is dropped, if arrangements are not satisfactory. Forcing an issue would do the hatchery more damage than good. An understanding or memorandum in written form telling the flock owners what is expected and what they can expect is sufficient and entirely satisfactory. Many use only oral agreements, or understandings.

Paying for Eggs.—A flat premium is usually paid for eggs, this being stated in the agreement, or contract. The basis may be the local market, the nearest large city market, or certain newspaper quotations, the highest grade being the one generally used. Occasionally this premium varies with the season, being less at the end of the season when chicks are cheaper and the margin of profit less. Sometimes a couple cents less per dozen is paid for Leghorns than for heavies, although this practice has largely disappeared.

Probably the most common figure is 10 cents above the market, although slightly lower premiums are rather common in certain parts of the country. Close to large cities, or where other market conditions force it, this figure is often increased. A few hatcheries are

adopting the practice of paying a certain percentage above the market, such as 40 per cent. With eggs at 30 cents, this would be 12 cents, and at 20 cents, 8 cents premium. This appears to be a reasonable basis.

ORIGINAL

RAMSHAW HATCHERIES

EGG RECEIPT

3687 South State St. Phone: Murray 474

Sold to _____ Salt Lake City, Utah, _____ 193 _____

Received from _____

Address _____

City _____ State _____

Sold by	Cash	C O D	Charge	On Acc't	Order Rec.	Paid Out
CASH	DOZ					
DIV. REPT. LTR						
PRICE						
AMOUNT						
TOTAL						
DESCRIPTION OF EGGS RECEIVED						
Hatching Eggs						
Cracked						
Undersized, Tinted Etc						
HATCHING REPORT THIS RECEIPT ONLY						
Per Cent Hatched		%	Bonus	% Hatch	Ticket No.	
Bonus Due \$				% Hatch	Ticket No.	
PAID (Ticket No.)				% Hatch	Ticket No.	
TOTAL						
DEDUCTIONS						
TRANSPORTATION						
APPLIED ON ACCOUNT						
Total Deductions						
Check Number						Not Balance
Received by _____						No. E 3839

BIRD BUSINESS UNITED STATES PATENT OFFICE 2,100,000

Fig. 27.—This egg receipt is printed in triplicate, one copy going to the flock owner when he brings in his eggs, while the original goes to the trayers who indicate the number qualifying as hatching eggs and the number rejected. The latter copy is returned to the office and the information transferred to the corresponding triplicate. The triplicate is then mailed to the flock owner with a check equal to the figure established by the contract for 50 to 60 per cent hatchability. The original of this receipt for ~~m~~ remains in the hatchery file. When the eggs hatch three weeks later, the procedure is repeated on current receipts of eggs, and bonuses for eggs which have hatched during the current week are added to the ticket in the space provided. The check then is made out to cover the advance on current eggs and bonuses on eggs received three weeks previously. (*Hatchery Tribune.*)

Where the flock owners pay for pedigreed males, or pay for the blood testing, an extra premium is usually paid above the general premium. Certain flock owners with outstanding quality, or of good advertising value, are often paid an extra premium or a flat price of so much per egg. Where an extra premium is paid, more is usually asked for the chicks from these flocks.

The ideal system, in theory, at least, is to base the premium on the hatchability of the eggs, then those giving the best care to their flocks and getting the best results get paid for their work, and those neglecting their flocks get less. Some hatcheries do this, but the bookkeeping involved seems to prevent more from adopting it. It should be more generally used. The procedure of paying on such a basis varies to some extent, of course, but some such basis as given below will give a general idea.

<i>Hatch</i>	<i>Premium</i>
50-55 per cent	8 cents
55-60 " "	9 "
60-65 " "	10 "
65-70 " "	11 "
70-75 " "	12 "
75-80 " "	13 "
80-85 " "	14 "
85-90 " "	15 "

Another procedure being adopted more or less generally is to pay an added premium above the base premium to those flock owners who feed a special breeder mash of the particular brand handled by the hatchery or the brand recommended by the hatchery. Hatcherymen have found by experience that flocks fed such special breeder mashes hatch enough better that they can afford to pay more for them. The fact that the hatchery generally makes a profit on the feed may have something to do with adopting such a policy, but the principal reason is the increased hatchability which naturally results in lowered egg cost per chick.

As a means of stimulating interest and better care, a few hatcheries are offering weekly prizes to the best hatching flock for each week. A few give bonuses if the average hatchability for the season is above a certain figure. A large number post the weekly hatchability figures for all flocks in a prominent place where they can be seen by the flock owners.

Payment is usually made weekly, either when the eggs are delivered, or it is mailed out during the week.

Where eggs must be shipped, the hatchery generally pays the shipping costs. Cases are furnished by the hatchery also.

Cooperating With Flock Owners.—The hatchery business is essentially agricultural manufacturing. Eggs are taken in from various sources and manufactured into baby chicks in three weeks. Profits vary according to the quality of the raw materials used plus the efficiency of manufacture and sales.

Since the flock owners are the producers of the raw product, it is nothing more or less than good cold business sense to cooperate with them, because cooperation will undoubtedly secure better hatching eggs. Flock owners sell eggs to the hatcheries for identically the same reason that hatcheries sell chicks to farmers and poultrymen, and that reason is to make money.

Consequently, they cannot be expected to cooperate unless the hatcheries can show them where they will also profit by any extra labor or extra expenditures required. It is comparatively easy for a hatcheryman to show the flock owners how they can benefit and how both will prosper together if certain practices are put into effect. For instance:

1. If the flock owners secure good stock, they get greater egg production and greater profits; the hatcheryman gets better chicks.

2. If the flock owner feeds properly, he gets greater egg production and greater profits, and the hatcheryman gets better hatches and stronger chicks. Such things as cod liver oil, alfalfa meal, and milk will accomplish these things.

3. Good houses for the flock owners mean greater winter egg production and certainly better eggs for the hatcheryman.

4. Good sanitation means fewer losses and better results for the flock owner and also for the hatcheryman.

It is better to explain to the flock owners why it is beneficial to all concerned to adopt these practices rather than tell them they have to do certain things. Some people will not be dictated to; in some places competition will not permit high handed methods, and cooperation will very likely mean that the flock owners will help to sell chicks where dictation will mean that they will hinder sales if possible.

Local business is becoming a more important factor all the time in the sale of chicks, and the good will of the flock owners is certainly one of the greatest assets possible in helping to get a larger share of this local business.

How to Cooperate.—The main thing in cooperating with flock owners is always to play the cards above the table. Tell them how certain things should be done and show them how it will be profitable to them. This can best be done by means of meetings and banquets where the plans are outlined and the information presented and discussed, and by means of service work whereby the hatchery has men in the field to give help and information. Have a definite plan of improvement, so that the flock owners know the hatchery is really making a serious effort to improve the quality. The great majority of flock owners will be willing to cooperate if they see the hatchery is also spending some time, effort, and money.

If there are any large increases in profits, the flock owners should, at least, be given a part share in this. They help to make the profits possible, and it is no more than fair that they should get at least a small part of the dividends in the form of hatchability bonuses.

If the hatchery is playing fair with the public in giving value received and in telling the truth in its advertising, flock owners are much more apt to cooperate. There are cases, of course, where the only method of securing results is to insist on certain quality and certain standards. This may antagonize a few, but it will give the community a clear demonstration that the hatchery stands for quality, and in the long run, this will make friends.

VII

FLOCK IMPROVEMENT

FLOCK IMPROVEMENT is an important part of the hatchery business. There was a time when the demand for chicks exceeded the supply. Then the most important thing was to get the eggs, almost any kind of eggs, and get them hatched. Now, supply generally exceeds demand, customers can choose their hatcheries with more discrimination, and the orders tend to go to those hatcheries that produce the best chicks.

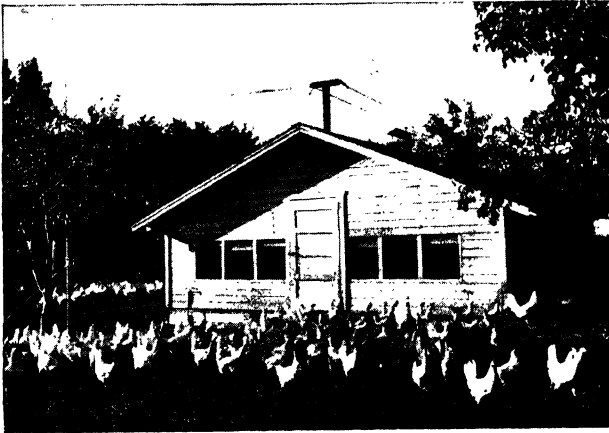


Fig. 28.—A foundation breeding flock on Henacres Farms in Washington for producing chicks for "branch flocks." All hens have laid 225 or more eggs in their pullet year, while the males have come from dams with records of 275 eggs or better.

Buyers want chicks that will live and be profitable as broilers, roasters, or laying stock, and naturally they want to get the best possible chicks for the price they are willing to pay. As competition becomes keener, the desire of the customer to get the best chick value for his money is more evident.

The amount of improvement work done varies greatly among hatcheries. Those catering largely to price buyers, as a rule, do very little, while the breeder-hatcheries are generally recognized as carrying on programs that will meet the needs of the quality buyers. Size of the hatchery in itself is no criterion of the quality of chicks produced, but admittedly hatcheries of extremely large size find a high type of flock improvement more difficult to achieve, because their eggs have to be drawn from a rather large area and because of the large number of flocks involved.

Flock improvement involves (1) culling, selection, and breeding for such factors as standard breed characteristics, vigor, health, egg production, egg size and quality, rapid growth, fast feathering, meat qualities, and livability of growing and mature stock; and (2) control of pullorum disease, formerly known as bacillary white diarrhea.

BREEDING PLANS

Just Eggs.—Some hatchery operators visit their flock owners in the fall or winter, and if the chickens are all of one breed, no further questions are asked, and the eggs are purchased when needed. This is the extent of their improvement work. Others buy their eggs from hatching egg dealers, some of whom carefully supervise their flocks, while others merely gather and ship or deliver the eggs to the hatcheries.

Individual Selection and Culling.—With this system, all birds in all flocks are individually handled. They are carefully culled and selected, so that only the better individuals in the flocks are retained. The reliable and better grade hatcheries now cull and select their flocks, competition having forced many to come to it.

This can be said to be the first real step in improvement. The quality of culling will naturally vary according to the knowledge, integrity and ability of those doing it.

Key or Seed Flocks.—Every hatchery has some flocks better than others. These flocks are better because of one or all of the following reasons: (1) better foundation stock, (2) better and more careful culling and selection, or (3) the use of better males.

These key or seed flocks are given special attention every year by the above methods. If pedigreed or R.O.P. males are used, they

are used in these flocks, and if chicks, or stock, are purchased from breeders, they go to these flocks. Permanent arrangements are often made between breeders and hatcherymen whereby the hatchery agrees to take so many pedigreed males every year for its flocks. This is a very satisfactory arrangement, since it gives the hatchery a sure source of good males every year, and the breeder an assured outlet.

All flock owners are then required every year to get their chicks from the hatchery, which sees to it that the chicks are from these choice or seed flocks. Very often the hatcheryman may own and breed the key flock, or flocks, and he is then known as a breeder-hatcheryman.

Breeding Farm.—The system that gives the closest supervision is where the hatchery operates its own breeding farm. Here, good foundation stock is secured; then every means possible taken to

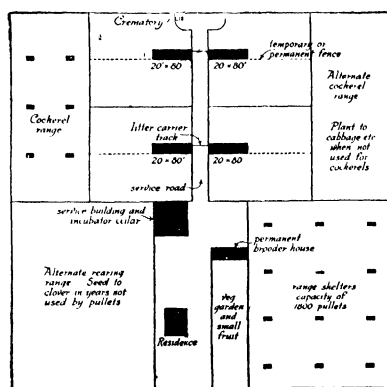


Fig. 20.—A suggested layout for a 15-acre 2,000-hen breeding farm. (*Poultry Tribune*.)

improve it. This includes trapnesting, pedigreeing, progeny testing, and careful selection and culling for standard qualities. This is, by all odds, the surest and quickest means of improvement. This home flock then serves as the key flock. Males are also provided for part or all of the other outside flocks.

Where properly operated and where attention is paid to appear-

ances, a good breeding farm is about the best advertisement a hatchery can have. But if poorly run and not kept up in appearance, it has little selling value.

A fine example of this system is that of a large middlewestern hatchery of 200,000 egg capacity. A large breeding farm is operated in conjunction, and 9,000 birds are kept, 1,800 pullets being trapped every year under official Record of Performance Supervision.



Fig. 30.—R.O.P. breeders trapnest their birds in order to locate the best producing individual birds, pedigree the chicks to identify, and record the performance of the offspring to determine which are the best families. This procedure is known as progeny testing. (*Ohio Poultry Improvement Association.*)

Every flock owner is required to get chicks from the home breeding flock every spring. Practically all of these chicks are from pens composed only of 200-egg hens or better, selected for good egg size, and mated to individually pedigreed R.O.P. males from high record hens and good families. This means that practically all chicks from this hatchery are only one generation away from 200-egg hens or better. R.O.P. pedigreed males are produced and furnished to all flock owners. Needless to say, this is a very high class hatchery. Very few people visit this place without becoming so impressed with the breeding methods that they become prospective customers.

CONTROLLED FLOCK PROGRAM

Flock improvement is a complicated procedure requiring attention to a great many details. Breeders who trapnest, pedigree, progeny test, and select with family records as a basis are likely to attain more improvement in a shorter length of time than hatcheries which carry on a much less intensified program with a great many more birds and a large number of flocks.

The quickest way for a hatchery to secure high quality stock is to go direct to good breeders and secure enough chicks from the breeders to establish a few flocks. These chicks need not be pedigreed stock, but they could be just one generation removed from pedigreed stock. These particular flocks should be kept pure and other flocks could be started from them. It would seem to be wiser to keep each strain pure rather than cross strains indiscriminately, for one is never sure what the outcome will be in the crossing of strains.

Pedigreed males should be brought in regularly to improve or maintain quality, and they should be secured from the breeder from whom the original stock was secured. Some hatcheries maintain careful records on each flock as to the source of the breeding stock, so that they know the breeding behind each one. If care is used in choosing the breeders from whom the original stock is secured in each breed and then care is used to see that all new breeding flocks are originated from these, any hatchery could very soon have all breeding flocks of good quality and of some of the very best strains in each breed.

Rigid selection, of course, should be followed in the culling of the flocks each year to maintain the quality. Doing this will certainly result in a uniformity that will surpass the method where the source of males is changed each year. Many hatcherymen erroneously think they must get males from a different strain every year or every other year in order to avoid inbreeding.

A few hatcheries even conduct what they call a closed flock program. This consists of starting a flock new as described above from some particular strain. Then this flock is "closed," meaning that no new stock is introduced and the flock is replaced each year by chicks hatched from the eggs produced by it. This is done to preserve the high quality in the flock, to maintain uniformity, and for

control of some forms of disease from which the flock is clean and is hoped to be kept clean by not introducing any outside stock that might bring in infection. In this type of program, records are kept on the performance of the offspring from each flock. If serious defects appear in the offspring, the entire flock is replaced with stock from a strain that is better.



Fig. 31.—Selecting males to head the breeding flock. (*Ohio Poultry Improvement Association.*)

One large string of hatcheries uses this type of program as a means of keeping down the amount of the “fowl paralysis complex” disease in chicks produced by them, claiming they use breeding flocks with little or no trouble of this kind. No definite data is available as to the actual results accomplished, but they have used this type of control program, whereas the majority of breeders are attempting to breed for resistance to the disease.

In the closed flock program, close selection should be practiced

to remove undesirable birds and retain the best for breeding purposes.

SELECTION OF BREEDERS

* . . *

Selection and culling is a subject for a book itself, and all of the details cannot be given in a part of one chapter. There is a vast amount of experimental evidence available, and the information given here is based largely on this evidence. Every hatcheryman should get a good book or bulletins on these subjects as well as on breeding, because they are closely related. Furthermore, every hatcheryman should attend the culling or judging schools given in his state and secure the latest information available.

The law of "like begets like" is as old as life itself. Generally speaking, but with some limitations, chicks will be like the breeding flocks from which they are hatched. If we do not cull and select, but breed from anything and everything, the chicks will turn out accordingly. On the other hand, if care is used, and if the individuals in each flock are selected for desirable characteristics, most of the chicks will have these desirable points.

Standard Qualities.—Most people like to have a nice uniform looking flock, the individuals of which are good specimens of the breed. All flocks should be culled with this in mind, and any individuals off-color or off-type, or having any standard disqualifications such as side sprigs, stubs, feathers on clean shanked birds, squirrel tails, wry tails, split wings, and other defects should be removed.

With very few exceptions, there is no reason why good breed type and color cannot be combined with high egg production. There is nothing that will lose business for a hatchery any quicker than selling chicks that grow up with off-colored feathers. The buyers feel they were given "mixed chicks," when they paid for purebreds.

The American Standard of Perfection outlines in detail the breed standards, qualifications, and disqualifications, and a copy should be owned and used by every hatcheryman. He should study it carefully and become thoroughly acquainted with points on the breeds which he hatches.

Vigor and Health.—To live and produce heavily as well as produce good hatching eggs, a flock must be composed of strong, vigorous, healthy individuals. Any birds showing signs of disease

or unthriftiness should be discarded. It doesn't pay to take any chances with sick chickens.

Vigor cannot be definitely measured except by general appearances, and very often, lack of it is associated with sickness and cannot be separately identified. For practical purposes, it makes no difference. Particular attention should be paid to the males, since from 12 to 30 females are used to one male, and his influence is in that proportion. Only the big, strong, vigorous individuals should be used.



Fig. 32.—An individual Record of Performance mating used to produce R.O.P. cockerels for use in breeding flocks. (*Ohio Poultry Improvement Association.*)

Egg Size and Color.—The hatcheryman is becoming more interested all the time in egg size, because the buyers of his chicks are selling their eggs more and more on grade, and undersized eggs greatly reduce their profits. If he continues to sell chicks the pullets from which lay small eggs, his business will most surely be seriously injured. The number of eggs laid was once the sole criterion of a good hen, but not today. Practically all egg laying contests now

rate the pens by points, a combination of egg size and number of eggs laid.

Furthermore, it is a well known fact that large chicks cannot be hatched from small eggs. Since large chicks are desired, the hatcheryman should be interested in seeing that the egg size is improved in the flocks supplying him with eggs. However, oversize is as undesirable as undersize. Oversize eggs, that is, those above 30 ounces per dozen, usually hatch poorly and are not especially desirable from a market standpoint due to the large amount of breakage in handling, unless special cases are used. In fact, when the eggs are above 28 ounces to the dozen, the hatchability will be noticeably lower. Eggs weighing between 24 and 28 ounces are the most desirable.

A number of investigators have established the fact that egg size is inherited. This means that constant selection for large egg size should be carried on, otherwise little progress will be made. With the constant use of males from large egg dams and the constant selection of desirable sized eggs, rapid progress can be made. Many hatcheries make a point of selecting especially fine eggs for the chicks to be hatched for the flock owners for flock replacement purposes. Some hatcheries use automatic egg graders to grade their eggs. Often special grades of chicks are offered, all chicks being hatched from 24-ounce or even 25-ounce eggs or better.

Egg color can also be controlled by careful selection. This is particularly important with white eggs where tints are undesirable. Tinted eggs should not be set, or, at least, the worst should be removed and the standards gradually improved as the color becomes better. Here again, special selection of eggs should be made for flock replacement purposes.

Select for Egg Production.—The quickest and surest method of improving egg production is by trapnesting and securing the individuals with high records and other desirable characteristics such as egg size, egg color, etc., and then pedigreeing to find out which individuals are prepotent and pass these desirable traits to their offspring with a high degree of intensity and regularity. This procedure, known as progeny testing, establishes high producing and desirable families and strains and discards the undesirables. This

explains why the breeder-hatchery is becoming very popular. No person can select as accurately as the trapnest.

Progress can be made, however, by selecting individuals according to what can be seen and determined by handling. The poor producing individuals can be culled or selected with a relatively high degree of accuracy and if they are removed, improvement will be made. To do a thorough and careful job of culling, it should be understood what egg production is and how it is inherited.

It has been demonstrated beyond doubt that egg production is inherited, but that several factors are involved and that the number of eggs produced is determined by these factors. They are separately inherited as individual traits and, hence, greater progress will be made if they are used as the basis for culling.

Early Maturity.—The early maturing or quick maturing pullets are, other things being equal, the better ones and make the higher records, and the late maturing ones are the poorer. Dryden (1921) found that pullets maturing in less than 200 days averaged 197 eggs per bird for the first year of production. Those maturing in 201 or 250 days averaged 189 eggs; 251 to 300 days, 158 eggs; and over 300 days, 112 eggs.

Since a large percentage of the birds in hatchery flocks often consists of pullets, early maturity is of tremendous value in selecting the better producers. The quicker maturing birds can be identified by larger size, more development of comb and wattles, and, as they come into production, greater width between the pelvic bones. If pullets are of different ages, this factor is of less value, because it is difficult to distinguish between the younger ones and the late maturing ones.

The first pullets to come into laying and the quickest maturing should be marked with legbands of a certain type or color. The latest maturing ones should be discarded.

Since early maturity is associated with early feathering, and late maturity with poor feathering, selection on this basis should help to improve the feathering qualities, particularly of the heavy breeds.

There is one point to be watched, and that is size of birds, for there will be many undersized birds in these early maturing individuals. If blind selection without regard to size is practiced, under-

sized flocks may result. Rigidly cull undersized birds, particularly males.

Because rate of maturity is inherited, it is of as much value in culling hatching flocks today as any point we have. It should also be one of the major factors in selecting cockerels.

Intensity of Production.—Other things being equal, a bird that lays 25 eggs a month is more valuable than a bird that lays 10 eggs.



Fig. 33.—This New Hampshire hen, which established a world record for the breed by laying 339 eggs and scoring 371 points in the 1942-43 standard laying tests, exhibited intensity to a high degree by laying an egg every day for 213 consecutive days.
(Irving Kauder.)

There is a tremendous difference in the intensity or rapidity with which birds produce. Some lay every third day, some every other day, and some every day for several days. When a bird lays several days without missing, we say she has a good cycle, and each bird follows a more or less regular cycle. It is very obvious that high record hens must possess this intensity factor. Since it is inherited, it is important that in culling every effort be made to select for this factor.

If culling is done late in the fall or winter after the pullets have

been in production, those that have bleached out the most pigment will give some indication as to which have produced the most rapidly. Culling pullets just before the hatching season will be of still greater value. Since hatcherymen, as a rule, cull only once a year, this would be impossible unless the flock owners could be induced to do it.

The other important indicator of intensity is the head. Methods of selecting layers on the basis of head characters and pigmentation changes are discussed in detail in the section of this chapter dealing with the general culling methods.

Winter Pause.—Investigators at the Massachusetts Experiment Station have shown that some birds have a characteristic winter rest and that this characteristic, or tendency, is inherited. Since birds must lay consistently at all times to make high records, this pause or rest tendency is undesirable, and birds showing it should be eliminated. The only way to do this is to mark those that quit producing in the winter. This applies, of course, only to pullets because most hens are out of production during the winter. Since most hatcherymen cannot do this, the flock owners should be encouraged to cull these birds regularly during the winter.

Care must be taken not to cull birds that are out of production because of other reasons such as change of feed, freezing, and molting because they were hatched early and laid early. Only when the great majority of birds in the flock produce right through the winter should this method of culling be carried out.

Broodiness.—Everyone raising the heavier breeds realizes full well the egg production lost by birds being broody and out of production. At the Vineland, N. J., Egg Laying Contest, Plymouth Rocks lost 24.2 days per hen from broodiness; Wyandottes, 29.6 days; Rhode Island Reds, 25.7 days; while White Leghorns lost only 11.8 days per hen.

Years ago people did their hatching and rearing with hens, and they selected and saved those hens that went broody. The more that went broody, the better. As a result, this factor, because it is inherited, became well fixed in most of our heavy breeds. Now we do our hatching in incubators and rearing with brooders, and we have to turn around and breed out this trait which was so desirable years ago.

Since the heavier breeds were used more for setting and rearing,

broodiness is more developed in them than in Leghorns. Hence, it is now a harder and longer job to eliminate it, but it can be done by constant selection. Here again, it cannot be done by the hatcheryman, but must be done by the flock owners. It is done simply by marking with legbands or otherwise those hens that go broody, and then eliminating them from the breeding pens. In addition, care should be taken to use males from non-broody mothers.

That progress can be made in the elimination of broodiness is shown by the work of Hays and Sanborn (1926). Starting in 1912 with a flock in which 89.6 per cent of the birds went broody during the year, by 1923 they were able to report that only 27.35 per cent of the birds in that flock exhibited broodiness. In that period, the number of broody periods per hen was reduced from 4.4 to 1.9, while the average annual egg production was increased from 114 eggs to 189 eggs.

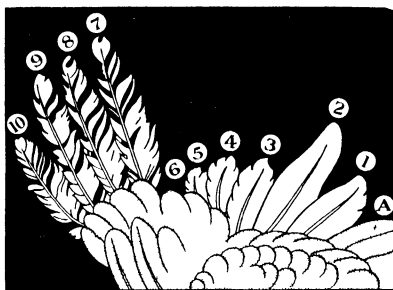


Fig. 34.—The primary feathers (the 10 outermost feathers on the wing) tell considerable about the molting progress of a hen. The wing shown here has two fully matured new primaries and four that are coming in. A hen with that many new feathers in July should be culled, but a hen with a wing like this in October or November is worth keeping. (*Poultry Tribune*.)

Time of Molt.—There is considerable data to show that those birds that stop laying the earliest in the summer are the poorest layers. Since the great majority of birds start to molt when they cease laying, we say that the early molters are the poorest producers.

The only exceptions are those birds that lay while they are molting, and they are usually good producers even though they molt early.

A hatcheryman with a careful improvement program should cull his flocks during the summer and remove the early molting hens that are not in production. Then, again, later in the fall, he can mark the late molting hens to be saved for breeders. At this later culling, he will also be able properly to cull the pullets. With capable flock owners, the hatcheryman can usually depend on some of them to carry out these culling practices.



Fig. 35—Breeding flocks should be carefully selected and bloodtested.

General Culling Methods.—Most hatcherymen cull their flocks only once each year, doing all of their selection at that time. In order to distinguish the layers from the non-layers, and to pick out those pullets which mature early and those hens that are persistent layers, a hatcheryman must be familiar with the characteristics that indicate whether or not certain pullets or hens are worth keeping.

Body Condition.—One of the methods of recognizing the layers and non-layers is to examine the condition of the vent, pelvic or pubic bones, comb, wattles, earlobes, abdomen and skin.

Vent.—The vent of a laying hen is enlarged, soft, pliable and moist. That of a hen out of production is dry and puckered.

Pubic Bones.—The pubic or pelvic bones of a laying bird are wide apart and pliable, while those of a non-layer are close together, except in very fat hens. Furthermore, the depth from the pubic, or pelvic bones, to the keel bone in the layer is much greater.

Comb, Wattles and Earlobes.—The comb, wattles and earlobes of the layer are large and full with a smooth waxy appearance and feel. At the end of the production period, these parts lose their gloss and appear more limp. These parts in the non-producer are small, shriveled, dry and usually covered with a white scale or dandruff.



FIG. 36.—The use of catching crates facilitates the handling of birds when culling and testing.

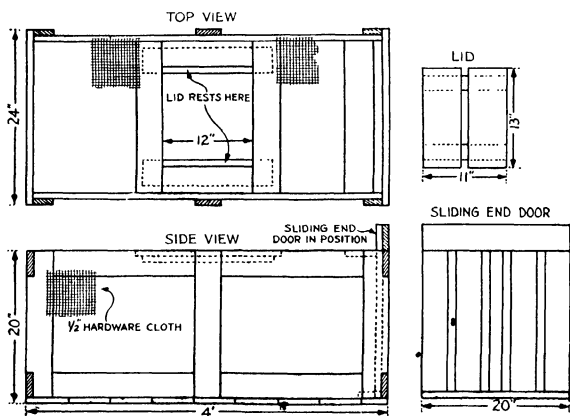


Fig. 37.—Diagram of a catching crate for use in culling.
(*Poultry Tribune.*)

Abdomen and Skin.—The abdomen of the good layer is usually full, soft and pliable. The skin all over the body is also soft and pliable, with less of a tendency to accumulate fat. The poor producers and nonlayers have either a badly shrunken abdomen or an overly fat condition, and the skin is either lacking in quality and pliability or has too much fat present.

Pigmentation Changes.—Birds of the yellow-skinned varieties, before they start laying, exhibit yellow color in the beak, skin, and shanks. It is similar to the yellow in the yolk of the egg. The coloring material is furnished by the feed, largely from yellow corn, and the green, leafy parts of plants. When the bird starts to lay, the coloring material in the feed is used for coloring the yolks of the eggs, and the amount that has been stored up in the skin, beak, and shanks gradually disappears. This constitutes a fading or bleaching, the extent and rapidity depending on the number of eggs produced.

Usually the skin around the vent will become bleached during the first week of production. The eye-rings, or the edges of the eyelids, bleach a little slower than the vent. In varieties having yellow skin and white earlobes, the earlobes will become white after about 10 days of laying. The beak also loses its color; the color leaves the corners of the mouth or base of the beak first, then fades gradually from base to the tip. Ordinarily, from four to eight weeks of laying, or the production of 25 to 50 eggs, will eliminate all color from the beak. The shanks are the last to lose their color, fading first in front and retaining longest the color just below the feather line at the rear of the hock joint. Normally, from three to six months of continuous production is necessary to bleach the shanks completely.

When a hen stops laying, the yellow color reappears in each of the above regions in the same order in which it disappears: (1) vent, (2) eyelids, (3) lobes (if white), (4) beak, and (5) shanks. Pigmentation usually returns much faster than it disappears, but this will depend largely on the type of ration, and the breed, age, and vitality of the bird. It is possible to gain some idea of how long a hen has been out of production by observing to what extent the pigment has been restored.

Head and Body Type.—Since the head is the nervous center, it is logical to believe that it will, to some extent, reveal the producing ability and the general makeup.

Those birds showing distinct evidence of being "fatheads" as indicated by unusually short, broad heads and so much fat in the face and head as to give them a puffed or wrinkled appearance, should be discarded. They turn feed into fat rather than eggs. On the

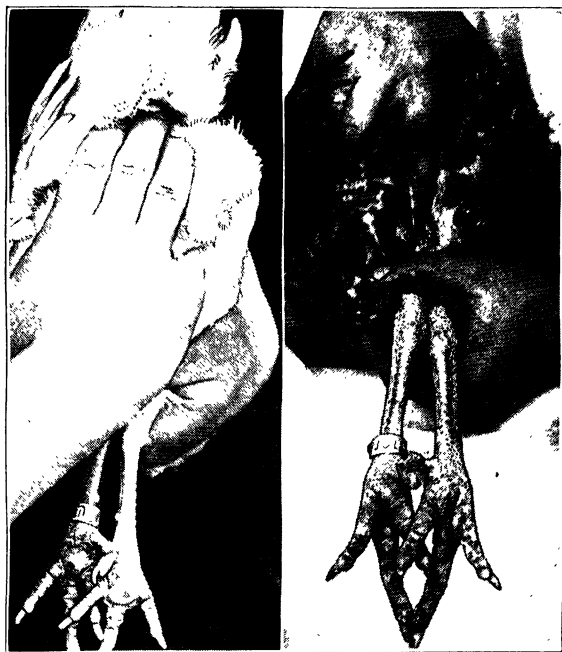


Fig. 38.—There is only 1 finger's space between the pelvic bones of the non-layer at the right, while 3 fingers can be placed between the pelvic bones of the layer at the left. (*American Poultry Journal*.)

other extreme, the "crowheads" as indicated by unusually long and narrow faces and heads, giving the appearance of lack of vitality, should be discarded. A bird must have vitality to lay 25 to 30 eggs a month and keep at it for a year, and, in addition, produce eggs that will hatch a large percentage of strong livable chicks.

The good birds have faces and heads intermediate between the fat-heads and the crow-heads. There are, of course, all sorts of vari-

ations. Good producers have clean faces free from fat and wrinkles, and bright prominent eyes that stand out as compared to dull sunken eyes in the poor layers. As a rule, the early maturing birds will have the clean cut appearance, while exceptionally late ones will be the fat-heads and crow-heads.

Head points are used by some to classify birds much closer than outlined above, but this ability is acquired only by a great amount of study and practice. Since the hatcheryman, as a rule, culls largely to eliminate the poorest individuals, he can competently do this by getting rid of the "fat-heads" and the "crow-heads" both in males and females.



Fig. 39.—These pictures show how the head of a cull compares with those of good layer. The cull at the left has a fat face, wrinkled skin, and sunken eyes. The high producer on the right, however, has a lean face, bleached beak, smooth wattles and face, and she looks alert. (John H. Vondell in *Everybody's Poultry Magazine*.)

The desirable body shows good width across the back and good depth from back to keel. These, of course, should be considered in relation to the size of birds.

Culling Chart.—Dakan and Winter (1930) arranged all information on general culling methods in the following simple chart:

JUDGING FOR PRESENT PRODUCTION

Character	Laying Hen	Non-Laying Hen
Comb	Large, red, full, glossy	Small, pale, scaly
Eye	Bright	Dull
Vent	Large, dilated, oblong, moist	Small, contracted, round, dry
Pubic bone	Two to five fingers spread	Less than two fingers spread
spread		
Body capacity..	More than two fingers spread between keel and pubic bones	Less than two fingers spread between keel and pubic bones

ESTIMATING PAST PRODUCTION

<i>Long Laying Period</i>		<i>Short Laying Period</i>	
Vent	Bluish white	Flesh colored	
Eyelids	Thin and edges white	Thick, yellow tinted	
Eye	Prominent, keen, sparkling	Listless, sunken	
Earlobes	Enamel White	Yellow tinted	
Beak	Pearly white	Yellow tinted	
Face	Clean cut, sunken	Full, well fleshed	
Shanks	White, flat, thin	Yellow, round, smooth	
Plumage	Worn, soiled, lifeless, close-feathered	Signs of molting, loose feathered	

ESTIMATING MERITS OF GOOD AND INFERIOR LAYERS

<i>Good Layers</i>		<i>Poor Layers</i>	
Head	Broad, square	Crow-headed, round	
Beak	Short	Long	
Eye	Bright, bulging	Dull, sunken	
Face	Lean, smooth	Meaty, wrinkled	
Comb	Large, fine	Small, coarse	
Breast	Full, broad	Shallow, narrow	
Back	Broad, long	Narrow, pinched	
Abdomen	Soft, pliable, dilated	Fatty, hard, contracted	
Skin	Soft, thin, loose, silky	Thick, dry, underlaid with fat	
Pubic bones ...	Tips thin, point straight out	Tips thick, curved in	
Keel	Slopes downward	Slopes upward	
Capacity	Four to five fingers	Two fingers	
Shanks	Lean, flat, fine scaled	Fat, round, coarse scaled	
Molt	Late, rapid	Early, slow	

What the Culling Program Should Include.—To sum up, here are the things a careful culling program should include:

1. Elimination of late maturing cockerels and pullets by summer and fall culling.
2. Elimination of fat-heads and crow-heads as indicating inability to produce fast or lack of intensity.
3. Marking by the flock owners of those individuals that rest in the winter, so they can be identified and removed.
4. Marking by the flock owners of those individuals going broody, so they can be identified and removed.
5. Elimination of early molting hens and selection of late layers or late molters.

SELECTION OF BREEDING COCKERELS

During a normal hatching season, each breeding male in the flock will be responsible for the production of about 400 chicks. This emphasizes the importance of proper selection of the breeding cockerels if the hatching egg flocks and the chicks sold are to be improved from year to year.

For many years, it was the practice of most hatcherymen to introduce new blood into their flocks by the purchase of partially or fully grown cockerels from breeders, placing these males in the various hatching egg flocks. Even though the males may have been kept in quarantine for several weeks, there was always the danger of introducing diseases of different types into the flocks.

In recent years, there has been a trend toward the purchase of pedigreed, day-old cockerel (sexed) chicks, usually out of matings consisting of hens with first year records of 200 or more eggs averaging 24 ounces or more to the dozen. These chicks are placed with one or more of the key flock owners to be raised. When the chicks are from 8 to 12 weeks of age, the hatcheryman makes his initial selection of the cockerels that possess the characteristics identified with good breeding males. A further selection is made when the cockerels are mature.

The procedure for selecting cockerels when they are 8 to 12 weeks of age was described by Townsley (1942) as follows:

Probably the best plan for selecting the cockerels is to visit the brooder house, or other enclosure where the birds can all be seen at one time, and with a catching hook, simply pick out and mark the best looking birds.

An easy way to mark the ones chosen is to fasten an ordinary round or three-cornered, smooth pig ring through the web of the wing of each bird to be saved. This is easily done, is inexpensive, and forms a permanent identification.

Some prefer to use colored spiral leg bands to mark the birds, but these must be watched to see that they do not become too tight as the birds grow.

Early maturity, rapid growth, plump body development, complete feathering, and freedom from disease and defects are the characteristics to be sought in the young cockerels.

Comb and wattle development are a good indication of the rate of maturity, and the most striking evidence of a good cockerel usually is a well reddened comb, and that is generally the first thing to attract attention in selecting males.

Deep yellow shank color in the American breeds and in Leghorns indicates good health and good rearing, and preference should be given to the cockerels that show the best shank color.

Only males that show a full complement of feathers should be considered. Under some conditions of management, feather picking may have made all of the cockerels

"bare backs," but since slow feathering is hereditary, it is not safe to save males that do not have the backs well covered, and do not show good tail development.

Likely looking birds should be handled to determine body development. Ribs and back should be well covered with smooth flesh, and should show good width throughout. Avoid birds that show prominent hip bones and taper sharply both ways from the hip joints.

Special attention should be paid to breast development. Pick birds with long, straight keels, but be sure the breast is broad and well fleshed, and that the keel is well covered with meat. Do not save birds that show narrow, sharp keels.

It is well to weigh the cockerels and save those that are above the average* in weight. The heavy birds not only are the fast growing ones, but are also the ones most likely to live and make good breeders.

Where the cockerels are being selected to mate with a certain individual flock, it is well to mark about three times as many as will be needed when mature, so that a further thorough selection can be made next fall.

Since some flocks are usually outstanding, it may be well in such a flock to mark as many good cockerels as are available, for use in other flocks where none of the males is up to standard.

There is no objection in using good cockerels for mating with pullets from the same source. In fact, better results usually are secured where the outstanding males from any given flock are selected for mating back with the hens and pullets of the same flock. However, poor males should not be used under any condition, and sufficient cockerels should be marked in the good flocks to supply the poorer ones next fall.

SELECTION FOR POULTRY MEAT PRODUCTION

With the rapid development of commercial broiler and roaster areas in different parts of the United States during the late thirties and early forties, selection of hatchery breeding stock for improvement of meat qualities began to receive more attention. In the Midwest, poultry packers long contended that they were not receiving the quality of market poultry they desired, and their entrance into the hatchery field was justified as a means of obtaining better quality poultry in the areas where they operated dressing plants.

Hatcherymen who supply chicks to broiler growers may want to develop certain flocks selected especially for meat production, but there is no reason why constant selection of all stock for better meat qualities, particularly in the dual purpose breeds, cannot be combined with breeding for egg production, for ultimately all chickens are sold for meat.

In selecting for meat qualities, emphasis is placed upon fast feathering, rapid growth, and good fleshing qualities.

Fast Feathering.—Since barebacks are heavily discounted in the markets, broiler growers want chickens that have been bred for fast

and full feathering. Fully feathered chickens result in less trouble with pin feathers at broiler and fryer ages.

It is relatively easy to develop a strain of fast and full feathering chickens. Fast feathering is recessive to slow feathering, so when

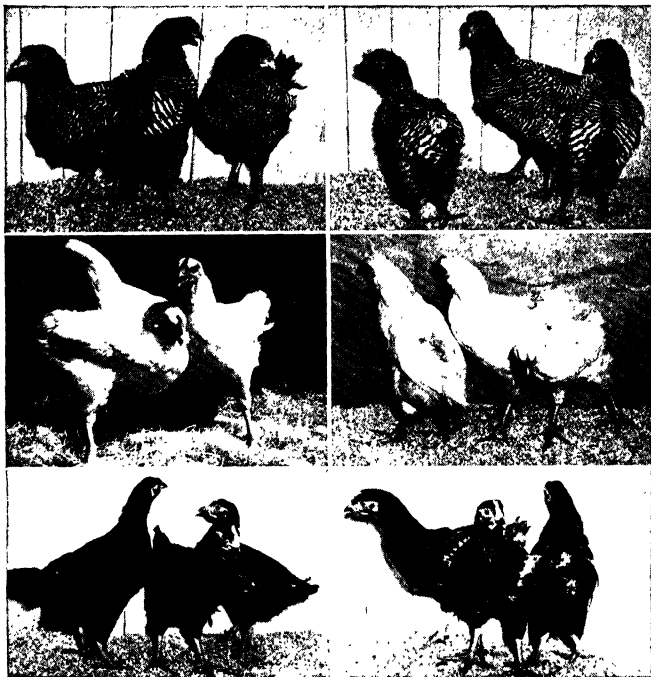


Fig. 40.—These photographs emphasize the difference in feathering and development at 10 weeks of age. The males at the left are well feathered and show good body development and should be marked as possible future breeding males. The males at the right are poorly feathered, lack development, and should be culled. (*Missouri Poultry Improvement Association.*)

fast feathering males and females are mated together, they produce practically all fast feathering offspring.

Fast feathering in day-old chicks can be determined by the length of the primary and secondary feather sheaths of the wing and the number of secondary feather sheaths. Fast feathering individuals

have well developed primaries and secondaries, while the slow feathering chicks have no secondaries and no primaries, or very short ones, showing. This selection should be done before the chicks are many hours old, otherwise some of the earliest hatched slow feathering chicks may be confused with some of the fast feathering late hatched ones.

Probably a more practical method of selecting rapid feathering individuals is to do it when the chicks are about 10 days or two weeks



Fig. 41.—Selection of breeding males from chicks that show good feathering at 10 days of age is effective, because environment has not had an effect on feather growth by that time. Note the rapid feathering of the chick on the left. (*Missouri Poultry Improvement Association.*)

of age. The desirable chicks at this age will show definite tail feather development, while the wing feathers will be much longer than in the slow feathering ones. Such chicks should be sorted out and raised separately, or they should be identified by toe punching, wing banding, or slitting the web of the toes. At 10 or 12 weeks of age these birds should be examined again, discarding any that show signs of not feathering fully and properly. This second selection makes it possible to eliminate any birds which may have shown rapid feathering at 10 days of age, but which later failed to feather fully.

If it is found impractical to start with both fast feathering males

and females, then the flocks may be improved by using fast feathering males for several years until this characteristic has been well established. Fast feathering is a sex-linked factor, hence, if only fast feathering males are used with some females that are slow feathering, all of the pullet offspring will be fast feathering, while some of the males will be slow feathering, having inherited this from their slow feathering mothers. If these fast feathering pullets are then mated to fast feathering males, all of the offspring should be fast

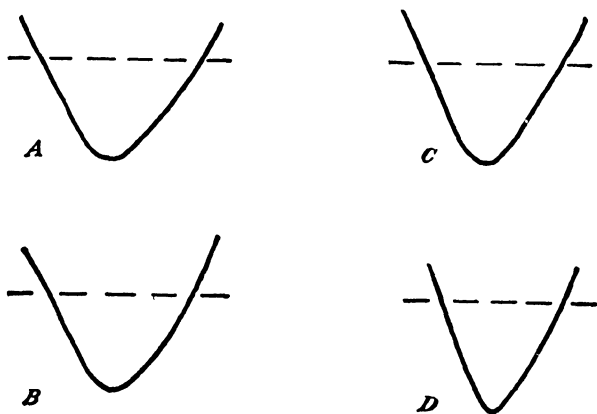


Fig. 42.—Breast types and grades of birds to be selected as breeding stock for broiler production. Observations made about three-quarters of an inch from the edge of the keel. A and B show fullness of breast, which is desired, while C and D are poorer types. (U. S. Department of Agriculture.)

feathering. If nothing but fast feathering pullets are used as breeders the second year, the problem is solved, but if old females are held over, some slow feathering males are apt to show up until such time as all the old females unselected for this factor are finally disposed of.

In some breeds it may be impractical to use both rapid feathering males and females at the outset, because there are so few of them. In such cases, only rapid feathering males should be used. In White Rocks, Single Comb Rhode Island Reds, and New Hampshires, many fast feathering individuals are apt to be found in most strains,

but in Barred Rocks and White Wyandottes, observation seems to indicate they are quite scarce. Most Leghorns, of course, are almost pure for this factor.

Rapid Growth.—Rapid, efficient growth is a most desired characteristic which is best measured by the weight of the birds at from 6 to 10 weeks of age and, certainly, not later than 12 weeks. From among the fast feathering individuals, mark those that are the heaviest and have made the best growth and show some signs of sexual development, giving due consideration to fleshing qualities. Some of those that grow rapidly early may not continue to grow rapidly at a later age, and another selection at about 20 weeks or so is desirable.

Good Fleshing Quality.—When chicks are measured for growth at from 6 to 12 weeks of age, they should be handled for fleshing

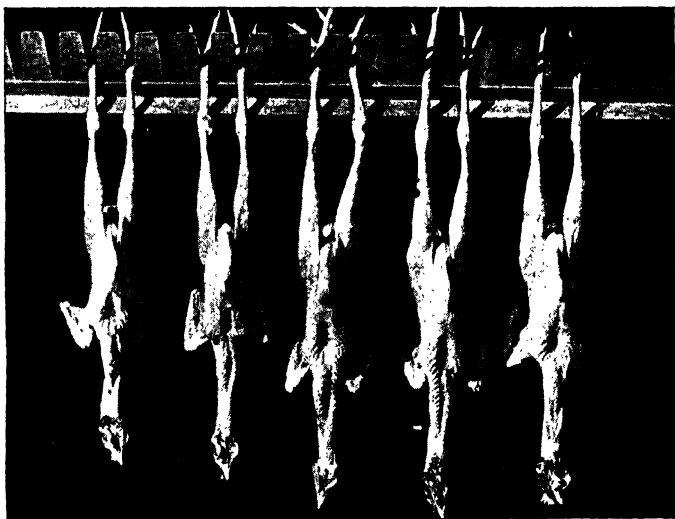


Fig. 43.—These New Hampshire cockerels were obtained from the same flock and were fed and managed the same. Although they are of the same age, some weighed over one pound more than others. Note how they differ in body shape, and degree of fleshing. These differences are due largely to breeding. Lack of uniformity and poor fleshing lower the price of dressed poultry and tend to discourage consumers from purchasing poultry meat. Note the crooked keel on the second chicken from the left, the breast blister on the middle chicken, and the poorly fleshed legs on the second chicken from the right. (*University of Maryland.*)

quality. While some grow rapidly and have the weight, they may be **f**angy, leggy, and poorly fleshed, especially on the breast, and do not make desirable broilers. Since the breast meat is the most valuable part of the broiler, this characteristic should be given special consideration.

Examine each bird individually, marking those that have made the best growth and also show the best breast development. Hold the chicken by the legs with the head down, examining the width and length of the breast. Mark for breeders those that are well fleshed, and discard those with thin breasts, defects such as blisters, indentations of the keel or breast bone, or crooked keels. This process should be repeated when the birds are mature, saving only the very best birds for breeders.

Selection of Adult Breeding Stock.—Dressers and packers of poultry have complained for years of the quality of adult birds which they receive, especially the condition of hens that have been through a year of laying. Too many come into these dressing plants in very poor flesh. Part of this is due, of course, to disease, worms, and poor feeding, but much of it is due to the fact that many birds are just of poor quality and inherit poor fleshing quality.

In culling and selecting adult breeding stock, remove poorly fleshed individuals, saving only the well fleshed individuals, especially those that have well fleshed breasts and normal, straight keels. Special attention should be given to male birds. Careful experiments have shown that the tendency for straight or crooked keels is inherited. By careful selection, strains of birds with a very small percentage of crooked keels can be developed.

THE FOWL PARALYSIS PROBLEM

Since fowl paralysis or the avian leukosis complex is responsible for more adult poultry mortality than any other single cause, hatcherymen at some time or other may find customers blaming them for losses caused by this disease. No section of the country seems to have escaped this disease. Sometimes, it will cause heavy losses for several years, only to subside in severity until mortality becomes negligible, and then appear some years later in a highly virulent form.

Cause and Symptoms.—Many studies have been conducted on fowl paralysis, but scientists still have much to learn about it. It is believed to be caused by a virus or several viruses, and it may manifest itself in one or more forms, such as paralysis of the legs and wings, blindness which is characterized by gray or pearly eyes, and contracted irregular pupils, tumors and anemia, thickened legs, and enlarged livers.

The U. S. Regional Poultry Research Laboratory established the fact that the disease can be transmitted through the egg and that it will spread from bird to bird when in contact in the same pens. Common observation seems to indicate that this spread may be rather heavy in certain flocks. There may also be other means of spread not yet ascertained. Research has also indicated that increased resistance to the disease can be secured by selection, and that as a result some lines of chickens may be more resistant than others.

Control Measures.—There are two general methods of attacking the fowl paralysis problem. One is to control it by eliminating as sources of hatching eggs those flocks that have shown any signs of the disease. There being no simple diagnostic agent as in pul-lorum disease, the only guide is what evidence of the disease can be seen with the eye. To keep a thorough check on flocks which might have fowl paralysis, it would be necessary to have records on where the chicks went and observe the performance of the offspring and to inspect flocks often and regularly.

The second method of controlling paralysis is to breed from birds that have shown themselves resistant in flocks that have had the disease. Breeding from resistant individuals, and more particularly from resistant families, has shown encouraging results, but it is complicated by the fact that a strain may be resistant to one type of virus and highly susceptible to a different type of virus in another area.

During flock selection and culling, watch closely for any of the common symptoms of fowl paralysis, particularly blindness or affected eyes. Those birds should be marketed while in good flesh. If allowed to remain in the flock, they will eventually become a total loss. Flocks that appear to be badly infected should be discarded entirely as a source of hatching eggs.

From the standpoint of the individual flock owner who is having trouble with fowl paralysis and is removing birds because they show symptoms of the disease, his losses can be reduced by rearing his chicks in complete isolation from the adult flock and by having them cared for by someone who does not come in contact with the older birds. At Cornell, it was found that the incidence of paralysis, decreased the longer the young stock was reared in isolation before being brought to the main plant where mature birds were kept.

CONTROL OF PULLORUM DISEASE

Pullorum disease, also known as bacillary white diarrhea, in years past, and even to some extent today, caused more controversy in the hatchery business than any other one subject. Many hatcherymen conscientiously believed (1) that there was no such disease, (2) that if there was, it didn't do any damage, and (3) that testing of the breeding birds was of little use.

Today, there are very few hatcherymen who do not believe there is such a disease and that it can result in very heavy chick losses. Furthermore, most of them know that testing is of tremendous value

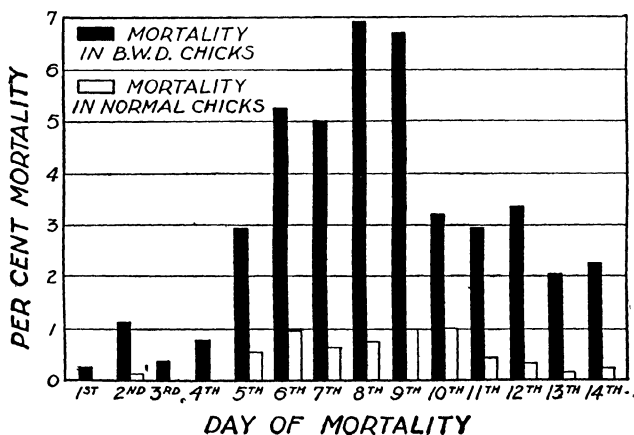


Fig. 44.—Graph showing distribution of mortality over a 14-day period for chicks infected with pullorum diseases in the incubator, compared with the same distribution of mortality for normal chicks. (*Kans. Tech. Bul. 29.*)

in reducing losses from this cause. Hatcheries have gradually improved their pullorum control programs. More retesting is being done, less custom hatching is being done from untested flocks, and more of the custom hatching is being done in separate incubators located in separate rooms.

The Theory of Testing.—Pullorum disease is due to a specific bacterium, *Salmonella pullorum*, which affects both chicks and adult birds. In baby chicks, it is highly acute and generally results in a rather high mortality among those broods infected.

This organism is the one poultry disease organism definitely known to be transmitted from the hen through the egg to the chick. It may also be spread from chick to chick in the incubator by means of the flying down and dust; it may be spread from chick to chick in the brooder through the droppings of diseased chicks; and it may be spread from mature bird to mature bird. A bacteriological examination is necessary for a definite diagnosis, although the mortality cycle in a brood of infected chicks is more or less indicative of the trouble.

There is no satisfactory cure for the disease. Control consists of prevention, and prevention consists largely of detecting the infected birds in the breeding flocks and removing them so that there is little or no infection present when the chicks are hatched, to spread in the incubators and brooders. Measures for preventing its spread in the incubator are discussed in Chapter XI on Hatchery Sanitation.

Experimental studies by Severens, Roberts, and Card (1945) indicated that sulfadiazine and sulfamerazine were very effective in preventing losses in chicks infected with pullorum disease. Survivors of chicks artificially infected with pullorum disease and then receiving these sulfonamides gave negative reactions to the bloodtest for the disease at nine months of age. These same drugs were effective in reducing losses from pullorum disease in turkey poults.

Testing for the detection of infected birds rests upon a long known principle that when a given bacterial suspension, the antigen, is mixed with the blood serum of animals which are infected with the same organism, the bacterial cells are caused to clump together or agglutinate. This clumping or agglutination is brought about by the action of specific antibodies or agglutinins in the blood of infected individuals, present as a result of the disease being in the body and

resulting in the formation of these antibodies. So in testing for pullorum disease, it is done indirectly by testing for the presence of antibodies which are present in the blood only because of the presence of the disease some place in the body. This is the part that many people do not understand.

There can be no argument whatever as to the existence of such a disease. The questions of importance to hatcherymen and breeders are:

1. How much danger does pullorum disease do?
2. How can it be controlled?

Effect on Livability of Chicks.—It is claimed that the amount of damage done to chicks by pullorum disease will depend on a great variety of factors such as feed, chilling, overheating, degree of infection, and others. Data are not available to show all these different points.

Results obtained at Wisconsin by Beach, Strange, Holmes and Halpin (1931) are contrary to those generally obtained, so they are given first. We quote from the report on their work:

Investigations have now demonstrated that hens reacting to the agglutination test for bacillary white diarrhea lay as many eggs as hens which are non-reactors, their eggs have equally high hatchability, and the little chicks hatched from these eggs laid by reactor-hens are as strong and vigorous, grow as well, and have as low death rate as little chicks from eggs laid by non-reactor hens.

The great mass of evidence, however, does not agree with the Wisconsin results. J. R. Beach and Michael (1930) of California reported 11.7 per cent mortality during the first two weeks for chicks coming from a reactor flock compared with a loss of 0.8 per cent for the chicks from a non-reactor flock.

Similar results were secured by Hinshaw, Scott, and Payne (1928) who obtained 35.98 per cent mortality from the chicks hatched from reactors in contrast to 7.53 per cent for the chicks from non-reactors.

Wildman (1930) conducted rather extensive tests. From 4,089 chicks hatched from eggs laid by flocks tested once, he experienced a mortality of 7.8 per cent, 2.6 per cent, and 3 per cent at the end of the first, second and third weeks, respectively. From 5,480 chicks coming from non-tested flocks, however, the mortality was 8.8 per cent, 19.7 per cent and 25 per cent for the corresponding weeks.

While more evidence of this nature could be cited, figures showing

the results obtained with large numbers of chicks brooded under actual farm conditions would probably be more conclusive. Connecticut is well known for its "Grow Healthy Chicks Program", which includes the following eight points: (1) clean chicks, (2) clean incubators and eggs, (3) clean brooder houses, (4) clean ground, (5) clean litter, (6) clean feed in hoppers, (7) clean management, and (8) clean laying houses. The difference in mortality when all eight points were followed and when all points with the exception of "clean chicks" were followed, is shown in Table VI.

TABLE VI.—MORTALITY OF CHICKS FROM PULLORUM INFECTED AND PULLORUM-FREE FLOCKS¹

(Figures cover period from hatching date to maturity)

	1926	1931	1935	1940
I. No. chicks where all 6 points were followed	219,314	346,177	753,808	1,002,949
Total Disease Mortality	7.9%	7%	5.6%	5.4%
II. No. chicks where 6 points were followed except chicks not free from pullorum disease	115,036	89,372	123,734	42,658
Total disease mortality	15.3%	12.9%	10%	7.6%
III. Increase in mortality	7.4%	5.9%	4.4%	2.2%

¹ Connecticut Grow Healthy Chick Program figures.

After a series of experiments, Moore, Mallman, and Arnold (1934) at Michigan showed quite conclusively the difference in mortality of chicks from infected and non-infected hens and the effect of low brooding temperatures on infected chicks. They also showed in these experiments that with low brooding temperatures there may often be a high spread of the disease in the brooders. As a result of these experiments, they concluded:

1. Chicks hatched from reactor hens and brooded at varying temperatures for the first week had a much higher mortality than chicks hatched from tested hens and brooded under similar conditions.

2. In the four brooding temperatures used, *viz.*, 96, 88, 80, and 72° F., chicks hatched from the tested stock did not show such an increase in mortality as the temperature in the compartments was lowered, as did the chicks hatched from reactor stock.

3. Chicks hatched from tested hens and brooded in the same brooder compartments with chicks hatched from reactor hens showed a higher mortality than when they were brooded by themselves under similar conditions.

4. Chicks hatched from tested stock have a much better chance of living when they

are subjected to hardship, such as improper temperature in shipping, or poor management after they reach the flock-owner, than have those chicks hatched from untested stock.

TABLE VII.—THE MORTALITY OF "CLEAN" AND REACTOR CHICKS BROODED TOGETHER
(Moore, Mallman and Arnold—1934)

Temperature of Compartment F.°	Clean Stock				Reactor Stock			
	Chicks	Mortality		Pullorum Infection (%)	Chicks	Mortality		Pullorum Infection (%)
		Number	Per Cent			Number	Per Cent	
72	153	72	47.7	78.1	80	58	72.5	86.2
80	153	29	19.0	86.3	80	49	61.3	95.9
88	153	25	16.3	84.0	80	37	46.5	97.3
96	153	11	7.2	91.0	80	26	32.5	100.0
Total	612	138	22.5	81.9	320	170	53.1	93.5

TABLE VIII.—THE MORTALITY OF "CLEAN" AND REACTOR CHICKS BROODED SEPARATELY
(Moore, Mallman and Arnold—1934)

Temperature of Compartment F.°	Clean Stock				Reactor Stock			
	Chicks	Mortality		Pullorum Infection (%)	Chicks	Mortality		Pullorum Infection (%)
		Number	Per Cent			Number	Per Cent	
72	98	4	4.10	25.0	162	120	74.1	88.3
80	98	6	6.10	16.7	162	83	51.2	86.7
88	98	4	4.10	0.0	162	62	38.3	87.1
96	98	1	1.02	0.0	162	48	29.6	98.6
Total	392	15	3.80	13.3	648	313	48.3	87.9

One fact should be clearly understood, and that is that the amount of trouble will depend on the amount of infection remaining in the flocks after they are tested, since in most cases all infection is not removed on one test. Therefore, the tolerance idea has developed in which all flocks showing over a certain percentage of reaction are retested until they come down to the permitted tolerance. For instance, where a 5 per cent tolerance is used, all flocks showing over 5 per cent reaction must be retested after 30-day intervals.

Vickers and Davisson (1942) showed that the lower the tolerance used, the less the amount of infection remaining in the flocks after testing as indicated by better chick livability and less infection in the flocks the following year.

TABLE IX.—CHICK MORTALITY BY BREEDS, BREEDING FLOCK TOLERANCES AND METHODS OF TESTING, 1941-42
(Vickers and Davison—1942)

Breed	2% Tolerance—Tube Method					2% Tolerance—Whole Blood Method					5% Tolerance—Whole Blood Method				
	No. Groups Chicks	No. Chicks Secured	No. Chicks Lost	% Chicks Lost		No. Groups Chicks	No. Chicks Secured	No. Chicks Lost	% Chicks Lost		No. Groups Chicks	No. Chicks Secured	No. Chicks Lost	% Chicks Lost	
White Leghorns	157	42,400	1,064	2.51		928	287,162	9,169	3.19		1,031	316,323	13,050	4.12	
White Rocks	212	48,809	1,239	2.58		403	83,621	2,101	2.51		1,773	482,068	21,929	4.54	
Barred Rocks	113	23,872	365	1.53		63	11,133	198	1.78		363	140,740	4,242	3.01	
S. C. Reds	29	5,458	63	1.15		2	658	8	1.20		82	16,544	1,075	6.49	
White Wyandottes	9	1,598	18	1.12		5	1,470	74	5.03		163	38,261	1,308	3.41	
New Hampshires															
Miscellaneous	60	13,517	228	1.68		391	105,880	2,460	2.32		186	47,082	2,012	4.27	
Totals, 1941-42	580	135,654	2,977	2.19		1,925	524,974	14,896	2.83		4,356	1,240,687	52,809	4.25	
Totals, 1940-41	655	168,676	4,745	2.81		1,101	310,616	7,656	2.46		3,550	878,818	34,745	3.95	
2 Yrs. Combined Totals	1,235	304,330	7,722	2.53		3,026	835,590	22,552	2.69		7,906	2,119,505	87,552	4.13	

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TABLE X.—RELATION OF AMOUNT OF INFECTION ON FIRST TEST TO MAXIMUM TOLERANCE PREVIOUS YEAR
(Vickers and Davisson—1942)

1939-1940

Previous Maximum Tolerance	No. Birds Tested	No. Reactors 1st Test	% Reaction 1st Test	% Flocks Retested
2% Previous Year.....	96,350	811	.8	10.6
5% Previous Year.....	68,144	1,439	2.1	12.3
7% Previous Year.....	422,682	15,651	3.7	21.0
None—New Members.....	116,703	6,809	5.8	37.3
All Groups—Old Members	587,176	17,901	3.0	18.7

1940-1941

2% Previous Year.....	143,274	1,838	1.3	17.3
5% Previous Year.....	266,843	7,946	3.0	26.7
7% Previous Year.....	330,078	12,219	3.7	26.4
None—New Members.....	248,518	13,684	5.5	36.5
All Groups—Old Members	740,195	22,003	3.0	25.1

1941-1942

2% Previous Year.....	179,328	1,542	.9	14.5
5% Previous Year.....	932,320	33,629	3.5	27.7
None—New Members.....	137,605	6,646	4.8	25.7
All Groups—Old Members	1,111,648	35,171	3.2	25.9

The evidence seems to point to the fact that the younger the chicks, the greater the danger of infection, and that as they get older, there is less danger. This does not mean, however, that they will not die later from infection secured earlier.

Hooker (1925) in "Investigations on Bacillary White Diarrhea Infection of Fowls" from the 1925 report of Agricultural Experiment Stations gives a complete summary of other data on this point up to that time.

The preponderance of evidence seems to be, therefore, that the disease is responsible for rather heavy losses in chicks, the exact amount varying with the amount of infection and environmental conditions.

Effect on Fertility and Hatchability.—For years it has been claimed that infected hens produced more infertile eggs and that the

fertile eggs hatched poorer than those from disease-free birds. If this be true, it is of interest to hatcherymen, because free flocks would mean less egg cost per chick and hence greater profits.

The Wisconsin results already quoted show no difference. Beach and Michael (1930) obtained a larger percentage of dead germs and dead-in-shell chicks from the reactors. Bushnell, Hinshaw, and Payne (1926) reported 25.8 per cent hatchability of eggs from infected hens compared to 57.3 per cent hatchability from non-reacting hens.

Bunyea and Hall (1930) in their results in agitated air machines for several hatches averaged 75 per cent from the non-reactors, and 66 per cent from the reactors; in still air machines, 69 per cent from the non-reactors and 53 per cent from the reactors.

In other experiments given in Kansas technical bulletin No. 29, the per cent hatch was 52.8 for the reactors and 59.2 for the non-reactors in one test, and 51.2 for the reactors and 60.9 for the non-reactors, in another. In still another test, the results were not so conclusive. Taking all results, however, it seems that poorer hatches are received from eggs from reacting hens and that testing should result in improved hatchability.

Extent of Disease.—That pullorum infection is quite general seems conclusive. There is much evidence showing the infection to run from nothing up to 70 or 80 per cent of the flock.

Rettger, Kirkpatrick, and Jones found (1915) 10.24 per cent of 14,617 birds infected. The results of Wildman (1930) show an average of 29.48 per cent infection, the Barred Rocks running 31.5 per cent; Rhode Island Reds, 34.2 per cent; White Wyandottes, 33.8 per cent; and White Leghorns, 12.6 per cent.

In more recent times the amount of infection has been reduced as a result of careful testing on the part of many hatcheries. The amount of infection by breeds for five different years of testing by members of the Ohio Poultry Improvement Association is shown in Table XI.

In these results, as in those from practically all other states, the White Leghorns show considerably less infection than the other common breeds indicating that undoubtedly this breed has an inherited resistance to the disease to a greater extent than most other

common breeds. This is substantiated in experiments by Hutt and Scholes (1941) who concluded as follows:

In controlled experiments with chicks of several strains of Leghorns and of heavy breeds the former were always more resistant to artificial inoculation with *S. pullorum* than were the heavy breeds. The difference between the two breeds were statistically highly significant.

Leghorn chicks not inoculated but exposed to the disease by contact were much more resistant than were Rhode Island Red and Barred Rock chicks exposed in the same way at the same time.

TABLE XI.—PER CENT REACTION ON FIRST TEST AND PER CENT FLOCKS RETESTED BY BREEDS
(Vickers and Davisson—1945)

Breed	1941-1942		1942-1943		1943-1944		1944-1945	
	Reaction 1st Test	% Flocks Retested	Reaction 1st Test	% Flocks Retested	Reaction 1st Test	% Flocks Retested	Reaction 1st Test	% Flocks Retested
White Leghorn	2.1	14.2	1.8	13.9	1.7	18.8	1.3	16.6
White Rock	4.0	30.9	3.7	34.3	3.4	38.4	2.6	31.7
Barred Rock	4.2	30.7	4.0	31.0	3.7	31.0	3.0	26.8
S. C. Red	3.5	25.8	3.2	29.5	3.7	31.5	2.6	23.7
White Wyandotte	5.3	39.9	3.7	28.8	3.5	32.6	3.2	32.9
New Hampshire	3.9	31.2	3.2	23.9	3.3	28.6	2.6	25.6
Crossbreds			4.7	34.3	3.6	32.4	3.4	31.9
Miscellaneous	4.0	24.2	2.8	20.5	2.7	26.4	2.5	19.2
Average— All Breeds	3.3	25.9	2.9	26.2	2.8	30.0	2.3	25.9

METHODS OF TESTING FOR PULLORUM DISEASE

Once the hatcheryman decides to test, the first question to decide is what test to use. There are three tests in common use:

1. Standard tube agglutination.
2. Rapid serum agglutination.
3. Rapid whole blood agglutination.

There is a fourth test, the intradermal or pullorin test, formerly used to a considerable extent, but used very little today.

There is some difference of opinion as to the relative efficiency of

the tube and rapid whole blood methods, these two being the ones in most general use. Most experimental evidence shows very little difference when both are properly conducted.

Most tube testing, however, is done under some type of official supervision by trained personnel in controlled environment, while much of the whole-blood testing is done by persons with limited training and more important, under all sorts of conditions and not under uniform conditions as is the tube testing. Furthermore, since most tube testing is under supervision, it is required that flocks reach a lower level of reaction before they can be used, while with much of the whole-blood testing, there is no supervision. It is easy to see, therefore, why tube testing so often gives better results than whole-blood testing. It is not that the test is better, but rather because often a better job of conducting the test is done.

It is a safe conclusion that either of these tests is sufficiently accurate to control the disease, providing it is done properly and providing sufficient retesting is done to get the amount of infection reduced to a very low level or completely eliminated. The tube method, however, is much more expensive than the whole-blood method, because all birds must be banded, then handled to secure the blood sample from each bird, then the laboratory test made, and then the birds handled again to remove the reactors.

With the whole-blood method, the test is made immediately while the birds are held and the reactors are removed immediately, avoiding a second handling. The expense of the laboratory test is also avoided. For these reasons, the great majority of testing now done is being done by the whole-blood method.

Standard Tube Agglutination Method.—This method consists first in banding the birds to be tested with numbered leg bands so that each bird can be identified with the blood sample which is taken from it to be tested. Then blood samples are taken from each bird in individual tubes, and each tube identified with the leg band number of the bird from which the blood sample is taken. These tubes are then sent to a laboratory for testing.

After the blood has clotted, the tubes are put in a cool place until the serum has separated from the clot. Then a small quantity of this serum is mixed with a small amount of test fluid or antigen. The antigen consists of pullorum disease cultures in suspension in salt

solution containing a small amount of preservative. This mixture is allowed to stand for 24 hours. Then the reading is made.

If the blood contains agglutinins, the organisms in the antigen are caused to clump together and sink to the bottom, causing the fluid to clear. This is known as a positive, or reactor. The non-reactors, or negative tubes remain cloudy in appearance. This part of the work must be done in a laboratory by trained technicians. After the infected birds are identified, the flock must be handled again to remove the infected or reactor birds.

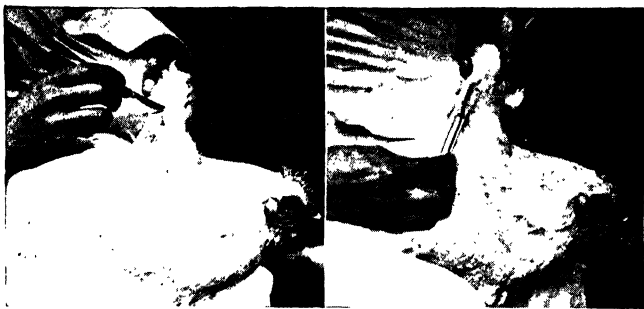


Fig. 45.—Collecting a blood sample for the serum agglutination test. The feathers are removed and the wing vein incised. The blood is then collected in a sterile vial. (*Ill. Agr. Expt. Sta.*)

Rapid Serum Method.—With this method, the samples are taken as above, but the serum after separating is mixed with antigen on a glass slide. The reaction is completed and can be read in from 1 to 15 minutes. With the reactors, clumping together takes place as in the tubes, while the serum remains cloudy in the non-reactors. This method seems to have given good results in practically all tests tried, and it is generally considered to be as reliable as the standard tube test.

Here again, after the blood samples are taken, the work must be done largely in properly equipped laboratories under competent technicians.

Whole-Blood Method.—With this method, a drop of antigen is placed on a plate, after which a wire loop of blood is thoroughly mixed with it by stirring. In the case of infected or reactor birds, a

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TABLE XII.—COMPARISON OF WHOLE BLOOD AND TUBE METHODS OF TESTING
AS MEASURED BY AMOUNT OF INFECTION FOLLOWING YEAR—1939-1940
(Vickers and Davisson—1942)

Previous Year's Maximum Tolerance	Method of Testing	No. of Flocks	No. Birds Tested First Test	No. Reactors First Test	% Reaction First Test
2%	Tube	277	54,112	599	1.1
2%	Whole Blood	52	42,238	212	.5
2% Totals	Both	329	96,350	811	.8
5%	Tube	114	22,538	592	2.6
5%	Whole Blood	171	45,606	847	1.9
5% Totals	Both	285	68,144	1,439	2.1
7%	Whole Blood	2,034	422,682	15,651	3.7
None— New Members	Whole Blood	646	116,703	6,809	5.8

1940-1941

2%	Tube	401	73,276	1,153	1.6
2%	Whole Blood	165	69,998	685	1.0
2% Totals	Both	566	143,274	1,838	1.3
5%	Tube	33	4,624	235	5.1
5%	Whole Blood	1,275	262,219	7,711	2.9
5% Totals	Both	1,308	266,843	7,946	3.0
7%	Whole Blood	1,642	330,078	12,219	3.7
None— New Members	Whole Blood	1,319	248,518	13,684	5.5

1941-1942

2%	Tube	462	89,449	1,008	1.1
2%	Whole Blood	262	89,879	534	.6
2% Totals	Both	724	179,328	1,542	.9
5%	Tube	39	6,271	333	5.3
5%	Whole Blood	4,633	926,049	33,296	3.6
5% Totals	Both	4,672	932,320	33,629	3.6
None— New Members	Whole Blood	724	137,605	6,646	4.3

clumping in well developed clumps or flakes will be noticed. Various degrees of reaction may be observed. Ordinarily, most reactions occur within a few seconds, but there may be some slow reactions occurring up to two minutes.



Fig. 46.—Bloodtesting by the whole blood stained antigen method. (*Ohio Poultry Improvement Association.*)

With birds that are not infected and do not react, this flocculation or reaction does not take place. A complete discussion of this method of testing cannot be given here, but we refer you to the following bulletin on this subject published by the United States Department of Agriculture—"Use of the Rapid Whole-Blood Test." Miscellaneous Publication No. 349.

This method was worked out by Bunyea, Hall and Dorset (1929)

who secured good results. Beach and Michael (1930), however, after several tests conclude:

If it can be assumed that the slow serum agglutination test provides a reasonably accurate means . . . the results of this trial of the fresh blood agglutination test on nearly 4,000 fowls are to be considered very poor. In its present state of development, therefore, the rapid agglutination test with fresh whole blood does not appear to be a satisfactory substitute for the serum agglutination tests . . .

Bleecker (1930) after some tests, however, found that with 2,159 birds there was an agreement with the tube test on 1,969 birds, or 91.15 per cent, and concludes as follows:

. . . in the hands of an experienced operator, if from 3 to 5 minutes be allowed before a diagnosis is made, the simplified agglutination test . . . is fully as efficient as the tube test.

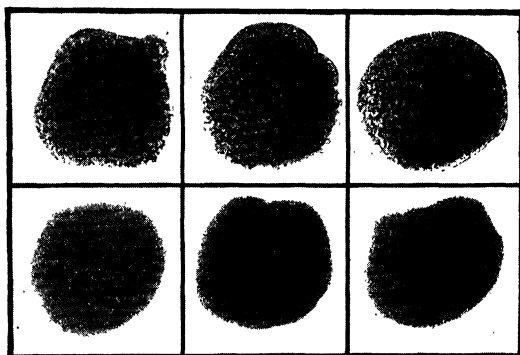


Fig. 47.—The blood samples in the upper row show positive reaction to the stained antigen test, indicating the presence of pullorum disease in the birds tested, while the lack of reaction in the blood samples in the lower row indicates that the birds tested are free of pullorum disease. (*Vineland Poultry Laboratories.*)

Biely and Roach (1934) as a result of their experiments conclude as follows:

Since this and previous studies show that there is a close agreement in the diagnoses made on the basis of the whole-blood and either the tube or rapid serum agglutination tests, the usefulness of the whole-blood agglutination test can no longer be questioned. Furthermore, since it is more adaptable to mass application, its value to poultrymen and to the industry as a whole is much greater. Since it lends itself so admirably to repeated application at short intervals, it is more practical than either of the other tests.

Vickers and Davisson (1942) as a result of their data secured in Ohio concluded that when compared on the same tolerance levels, the tube and whole-blood methods of testing appear to give equally good results when measured by the amount of infection found in the flocks the following year or by chick livability.

The addition of dyes to the antigen makes the determinations much easier and greatly increases the value and accuracy of this method.

This test has several advantages:

1. It can be done in the poultry house.
2. Only one drop of blood is needed, getting away from any danger of heavy bleeding as in taking tube samples.
3. Very little expensive equipment is needed.
4. It is much quicker.
5. Can be applied by the hatcheryman.
6. Requires no second visit to remove reactors.

The Intradermal, Wattle, or Pullorin Test.—This test consists of injecting a small amount of the pullorin or test fluid into the skin of the wattle. A reactor or infected bird is indicated by a swelling several hours later of the wattle that was injected. Most of the investigations of this test failed to show satisfactory results. It is rarely used today, because in addition to the question of its reliability in comparison with the other tests, it is necessary that the flock be handled twice, which increases the labor and cost of doing it.

Reasons for Poor Results.—Quite often, hatcherymen test their flocks, yet there are heavy losses in the chicks from the disease. It is hard for them to understand this. It often resulted in many being skeptical of the value of testing. Some of the possible reasons for trouble even after testing are outlined here in brief.

1. If there is some infection, no matter how slight, left in the flocks, there is always danger of spread in the incubators if any infected eggs hatch, and of spread in the brooders, especially where brooding conditions are not of the best.

2. The birds are actually tested for the presence of antibodies which are present, because the disease is present and has been active. Some birds undoubtedly have the disease present in a dormant or inactive form at the time of testing with the result that no antibodies have been formed and the birds do not react when tested.

Later the disease becomes active and these birds cause lots of trouble. For this reason, it is much better to test pullets after they are in production, because if the disease is present, it is more apt to become active after the ovaries start functioning and egg production starts.

When considerable infection is indicated on the first test, it is almost certain that there are some infected birds that fail to react and are missed. For this reason, trouble often results with only one test. Flocks that show considerable infection should be retested every 30 days until the level of reaction is very low, or there is none at all.

Many hatcheries do little or no retesting, hence have trouble. Furthermore, where the level of reaction is not low, not much progress seems to be made from year to year in reducing the amount of infection in the flocks, because too much infection is left to spread.

This is well shown in the Ohio results in Table XIII which shows clearly that all infected birds do not react on the first test. Also they clearly show the importance of retesting where any appreciable amount of infection is present if the disease is really to be controlled. And they clearly show why one test annually may result in little progress.

TABLE XIII.—THE PERCENTAGE OF REACTORS ON SUCCESSIVE TESTS
(Vickers and Davisson—1942)

No. Times Flocks Were Tested	No. Flocks	% Reaction 1st Test	% Reaction 2nd Test	% Reaction 3rd Test	% Reaction 4th Test	Total % Reaction After 1st Test and Found On Subsequent Tests
1	2390	1.9				
2	742	10.1	2.1			2.1
3	155	13.1	9.1	1.8		10.9
4	7	14.6	9.0	6.8	1.3	17.1

3. Many hatcheries custom hatch eggs from untested flocks in the same incubators with the eggs from their tested flocks. With the dangers of incubator spread, it can be easily seen why such hatcheries have trouble and make little headway in their testing work.

4. After testing has been completed, some flock owners are known to separate the reactors until the hatcheryman is gone and then put them back in the flocks. Unless the non-reacting birds are banded, there is no way of knowing whether or not this has been done without retesting the flock. Banding of all breeding birds is one of the many good requirements in the National Poultry Improvement Plan, because this point can be checked when flocks are inspected.

Naturally, testing does no good unless the reactors are disposed of, and hatcherymen should take the necessary precautions to see that they are. The surest way is to remove them from the premises at the time of testing or when reactors are removed, in the case of tube testing.

Consistent Testing.—Years of experience have shown conclusively that the only satisfactory way of controlling this disease is to eliminate it entirely or get the amount of infection so low that little or no trouble results. Presumably, the ideal situation is to remove all infection which means testing until there are no reactors, then hatch no other eggs, making virtually an airtight program. The National Plan provides for two such stages, one where all flocks show no reactors, the Pullorum Passed Stage, and one where all flocks show no reactors for two consecutive tests at least 6 months apart, the Pullorum Clean Stage.

The results from New Hampshire over a long period show what can be done where conditions are conducive to carrying on such a tight program.

Hatcherymen pretty generally report that when chicks are brought from hatcheries or breeders that have had no infection in their flocks for a number of years to an area where the flocks generally have considerable infection, this imported stock in a very short time shows an unusually heavy infection, much more than the native stock that has been living in the presence of the disease for many generations.

The only logical explanation seems to be that birds living in the presence of the disease have acquired a certain amount of inherited immunity which those never subjected to the disease do not have. There are many examples of this in animal and human life. For this reason, hatcheries importing stock from areas where the breeding flocks are and have been free from pullorum disease should be very

careful in how it is handled and see that infection is kept at a very low level, or a great deal of trouble will be experienced.

TABLE XIV.—PROGRESS OF PULLORUM TESTING IN NEW HAMPSHIRE

Season	No. Flocks Tested	Number of Birds Tested	% Infected Flocks	% Birds Positive of Total Number Tested	Pullorum Clean and Passed Flocks Meaning No Reactors on 1 or 2 Consecutive Tests	
					No. Flocks	No. Birds
1925-26	123	35,237	34	2.50	73	22,199
1926-27	144	72,937	25	1.81	102	46,375
1927-28	167	82,605	35	2.97	105	45,504
1928-29	173	119,380	27	1.50	101	77,717
1929-30	164	146,853	18	.47	119	115,044
1930-31	190	159,369	18	.94	133	112,977
1931-32	196	202,323	13	.50	149	161,205
1932-33	209	212,363	7	.40	173	183,077
1933-34	203	206,443	4	.16	172	188,909
1934-35	206	225,299	7	.15	178	183,649
1935-36	284	336,417	10	.18	232	298,217
1936-37	442	521,974	8.6	.36	402	499,225
1937-38	420	525,888	4.0	.06	405	520,120
1938-39	546	685,459	3.8	.20	525	657,201
1939-40	558	782,626	2.3	.04	545	772,312
1940-41	532	804,953	2.2	.02	520	796,107
1941-42	585	950,116	1.0	.01	579	943,716
1942-43	599	1,056,191	3.5	.12	578	1,024,213
1943-44	748	1,225,171	3.5	.04	722	1,182,408
1944-45	741	1,253,443	4.0	.08	711	1,196,600

DeVot, Quigley, and Byerly (1941) have substantiated this belief of many hatcherymen by experiments in which they found that pullorum clean flocks produced chicks which were relatively susceptible to pullorum induced by artificial exposure.

Pullorum Disease in Turkeys.—Pullorum disease in turkeys

has become common. It was doubtless originally transmitted to turkeys from chickens, but is now established in many turkey breeding flocks where it passes through the same life cycle as in chicken flocks. Undoubtedly, many turkey poults are now first infected by being hatched in incubators with infected chicken eggs. For this reason, where at all possible, turkey eggs should be hatched in separate incubators.

The efficiency of the whole blood test in the past has not been very high as results obtained by Hinshaw (1939) show. The tube test in a dilution of 1 to 25 has proved much more reliable. Recent experiments with new whole blood antigens, however, indicate that they are being rapidly improved and likely within a relatively short time antigens will be developed that will give as satisfactory results as those obtained when using the test on chickens.

Hinshaw (1939), reports a total mortality in 56 acute outbreaks in California involving 44,472 poults less than one month of age, of 18,464 poults, or 41.5 per cent. It can thus be seen that the problem is rapidly becoming as serious in turkeys as in chickens and needs prompt and vigorous action.

Resistance to Pullorum Disease.—Roberts and Card (1929) found a great variation among chickens with respect to their resistance to infection. Their evidence seems to indicate that this resistance is hereditary, because chicks from certain hens showed much more resistance than those from other hens when artificially infected. These experiments indicate that there are possibilities of breeding strains that will be highly resistant to the disease, but this is a long time proposition and not one of immediate value to hatcherymen.

THE NATIONAL POULTRY IMPROVEMENT PLAN

The National Poultry Improvement Plan has become an important part of the hatchery business and every buyer of chicks should be acquainted with it and its provisions in a general way, and every hatcheryman should also understand it whether or not he participates because it vitally affects his business. For this reason the plan is given in brief form here taken from U.S.D.A. Miscellaneous Publication No. 317:

Progressive poultrymen and hatcherymen have long recognized the need for or-

ganized poultry-improvement programs on breeding and pullorum-disease control. Many of the States have been conducting such programs successfully for a number of years. Because of a lack of coordination among programs and the use of conflicting terminology, however, the need for a coordinated national plan with uniform provisions and terminology became increasingly apparent. To meet this need the National Poultry Improvement Plan was formulated by representative poultry leaders after 10 years of careful consideration of the problem. It was placed into operation July 1, 1935.



Fig. 48.—An inspector handles birds in a breeding flock to make certain that the flock meets the requirements specified in the National Poultry Improvement Plan. (*Ohio Poultry Improvement Association.*)

HOW THE PLAN ASSISTS THE POULTRY INDUSTRY

The National Poultry Improvement Plan has been developed to assist the poultry industry in placing itself upon a more sound and efficient basis. This is being accomplished through (1) improving the efficiency of production of eggs and poultry meat by the general application of better breeding improvement practices; (2) reducing the losses of chicks from pullorum disease and improving the viability of poultry through better sanitary practices in breeding flocks and hatcheries; (3) the use of official terminology in the identification of breeding stock, hatching eggs, and chicks with respect to quality; and (4) the establishment of an effective cooperative program through which the best results from scientific research and practical experience can be most readily applied to the improvement of poultry and poultry products.

ADMINISTRATION OF THE PLAN

The plan is administered cooperatively by an official State agency, in each of the cooperating States, and the Bureau of Animal Industry of the United States Department of Agriculture. The official State agency recognized by the Bureau of Animal

Industry is usually the agency that was administering the State poultry-improvement program prior to the adoption of the national plan and it may be the State department of agriculture, State college of agriculture, State poultry improvement board or association, or similar organization recognized by the State government. Authority for an official State agency to administer the plan within the State is a memorandum of agreement between it and the Federal Bureau of Animal Industry. This State agency directs, supervises, and is responsible for flock selection, testing for pullorum disease, and other local administrative work involved in the operation of the plan. The Bureau of Animal Industry is responsible for coordinating the program among the States in which the plan is in operation.

WHO MAY PARTICIPATE AND HOW

Any poultry breeder, hatcheryman, or flock owner in a State having an official State agency for administering the plan may cooperate in the program by signing an agreement with this agency and complying with the provisions of the plan. Following proper certification of the quality of his flocks and hatchery products by the State agency, such flock owner, hatcheryman, or poultry breeder may then use the emblem, designs, and terminology of the National Poultry Improvement Plan in advertising his flock or hatchery products. The plan is Nation-wide in scope. The adoption of the plan on the part of States or individual industry members is entirely voluntary, but participants must meet its minimum requirements. Participation in the plan has grown steadily since its inauguration, and breeders and hatcherymen in 45 States are operating under official supervision, in compliance with provisions of the various breeding and pullorum-control phases of the plan.

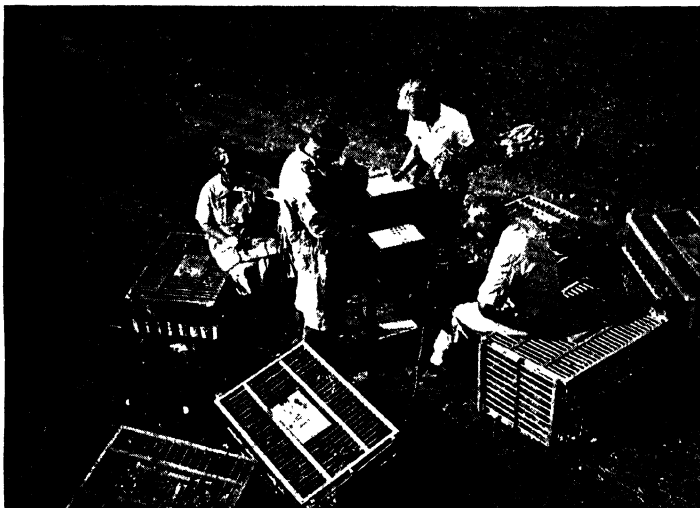


Fig. 49.—Authorized agents selecting and blood-testing a National Poultry Improvement Plan breeding flock. (*Georgia Agricultural Extension Service.*)

SELECTION, TESTING, AND INSPECTION

All breeding birds used in any stage of the plan must be of a standard breed and variety. The males and females in the breeding flocks are selected* individually for constitutional vigor and standardbred and production qualities by authorized flock-selecting agents or State inspectors. At the time of selection each accepted bird is banded with a sealed and numbered official leg band. Flock-selecting agents are trained by the poultry department of the State college of agriculture or other properly constituted agency in standardbred and production judging and in the provisions of the plan as applied in the State before being authorized by the official State agency. Inspections of breeding flocks and hatcheries are made by State inspectors employed by the official State agencies.

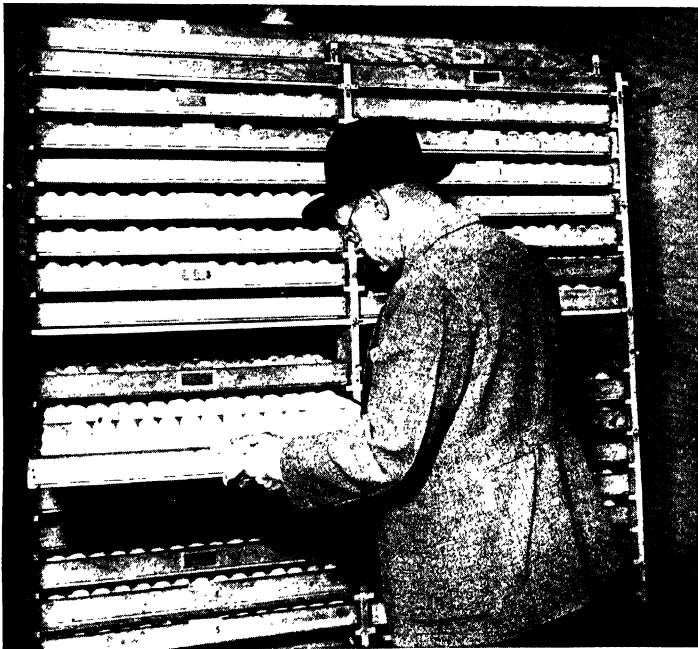


Fig. 50.—A hatchery inspector checking the eggs in the incubator of a U. S. Approved Hatchery. (*Ohio Poultry Improvement Association.*)

The testing of birds for pullorum disease is done by a livestock sanitary official, a representative of the State college of agriculture, or a pullorum-testing agent who is authorized by the official State agency to do pullorum-testing work. Testing agents are required to take a course of training and pass an examination on (1) pullorum testing as prescribed by the State livestock sanitary authorities or officials of the State

college of agriculture and (2) on the National Poultry Improvement Plan and official State agency provisions. In many cases the same person qualifies to do both flock-selecting and pullorum-testing work.

Participating breeders, hatcherymen, and flock owners are required to keep their premises and equipment in a sanitary condition. In addition, for the purpose of identification, and to aid in official inspections, hatcherymen keep records of the name and address of each flock owner, the number of eggs received from him, the name and address of each purchaser, and the number, breed, variety, and date of shipment of all chicks sold. Such records are open for official inspection at all times. Selection and testing are performed under the supervision of State inspectors, and breeding flocks and hatcheries are regularly inspected to insure compliance with official regulations and as an aid in effective improvement work.

LABELS, DESIGNS, AND TERMINOLOGY

A combination of terms with the prefix "U. S." and labels and designs indicating the exact breeding stages and pullorum-control classes are provided for the participating breeders and hatcherymen to identify their breeding stock and hatchery products. The various designs are in specified colors for attractiveness and ease of identification. Use of the official terminology of the plan and the labels and designs is limited to those who are participating and complying with its provisions.

The plan requires all proposed advertising to be submitted to the official State agency and to have its approval before publication.



Fig. 51



Fig. 52



Fig. 53



Fig. 54



Fig. 55



Fig. 56



Fig. 57



Fig. 58

Emblems used to indicate the breeding stages and pullorum-control classes under the National Poultry Improvement Plan.

BREEDING STAGES

The plan includes four progressive breeding stages, each having successively higher requirements in the following order: (1) U. S. Approved, (2) U. S. Certified, (3) U. S. Record of Performance, and (4) U. S. Register of Merit.

Minimum requirements are established for each breeding stage. However, an official State agency may set higher standards for the operations within a State, or an individual breeding farm or hatchery may set higher standards for its own operations. The plan is not intended to limit a participant's efforts, but to encourage and stimulate interest in the use of the most advanced breeding and management methods known.

There are a number of general requirements that apply to all breeding stages and pullorum classes. All eggs used for hatching must be reasonably uniform in size and shape and sound in shell. In the case of all white-egg breeds, U. S. Approved hatching eggs are required to be reasonably free from tints and eggs of the other U. S. breeding stages are required to be free from tints. Only chicks that are normal and representative of the breed and variety and that weigh at hatching time at least 8 pounds net per hundred are permitted to be sold as "plan" chicks.

U. S. APPROVED BREEDING STAGE

In the U. S. Approved breeding stage the males and females comprising the breeding flock are selected for constitutional vigor and standardbred and production qualities by flock-selecting agents or State inspectors.

Hatcheries producing U. S. Approved chicks must have all the breeding flocks from which they obtain hatching eggs selected annually by an authorized flock-selecting agent and approved by a State inspector. Each hatchery is inspected by a State inspector during the hatching season. Hatching eggs are selected carefully for size, shape, color, and shell texture, and all hatching eggs must weigh at least $1\frac{1}{2}$ ounces each, except that with the approval of the official state agency, eggs weighing 22 ounces to the dozen may be set during June, July, August, September, October, and November. Any U. S. Approved hatchery may produce and offer for sale only U. S. Approved or U. S. Record of Performance chicks of one variety. However, it may produce and sell U. S. Certified chicks of some other variety, but the hatchery retains the identity of the lower breeding stage, namely, U. S. Approved.

Provision is also made in the plan for the production of U. S. Approved crossbred hatching eggs and chicks. The parent stock must be well selected for good vitality, growth, market quality, egg production, feathering, and egg weight.

U. S. CERTIFIED BREEDING STAGE

In the U. S. Certified breeding stage the females must meet the same requirements as in the U. S. Approved, but the males must be U. S. R. O. P. males. These males are described under U. S. Record of Performance Breeding Stage.

Hatcheries producing U. S. Certified chicks must have all the flocks from which they obtain hatching eggs inspected and certified by a State inspector. Each hatchery is inspected at least twice during the hatching season by an official inspector and all hatching eggs must weigh at least $1\frac{1}{2}$ ounces each and average at least 24 ounces to the dozen, except that eggs weighing 22 ounces to the dozen may be set during June, July, August, September, October, and November.

U. S. RECORD OF PERFORMANCE BREEDING STAGE

The breeders in this stage carry on a very extensive program of trap nesting, pedigree breeding, and record keeping. All of their breeding operations must be under official supervision, and all candidates for U. S. R. O. P. and qualified U. S. R. O. P. females used in U. S. R. O. P. matings must be trap-nested. To meet the U. S. R. O. P. requirements a female must lay during 12 consecutive months at least 200 eggs that average 24 or more ounces to the dozen for the last 9 months, must be free from

standard disqualifications, and must be a reasonably good representative of the breed and variety. The male progeny from U. S. R. O. P. matings (U. S. R. O. P. male $\times$ U. S. R. O. P. females) may meet U. S. R. O. P. requirements at maturity if they meet proper physical requirements, are free from standard disqualifications, and are good representatives of the breed and variety as designated in the American Standard of Perfection. The chicks hatched from U. S. R. O. P. matings are individually pedigreed and officially wingbanded at hatching time. Detailed records are kept on trapping, hatching, and wing-banding operations and on progeny performance.

U. S. REGISTER OF MERIT BREEDING STAGE

In this most advanced breeding stage recognition is given to sires and dams on the basis of the performance of their daughters. A male that heads a supervised single-male mating is considered a U. S. R. O. M. male when a minimum of 20 and at least one-half of his daughters entered under U. S. R. O. P. supervision qualify as U. S. R. O. P. females. A female member of a single-male mating qualifies for U. S. R. O. M. when a minimum of four and at least one-half of her daughters entered in U. S. R. O. P. qualify as U. S. R. O. P. females.

PULLORUM CONTROL

Pullorum disease (bacillary white diarrhea) is widespread, existing in every section of the United States where appreciable numbers of poultry are kept. It causes heavy financial losses, resulting from the deaths of baby chicks, diminished egg production in hens and pullets, reduced hatchability of eggs, and occasionally the death of hens due to generalized pullorum infection. Fortunately this disease may be controlled adequately by making blood tests of the breeding stock and removing all individuals that react. It is likewise important to employ sanitary methods in incubation and in grading and brooding chicks in hatcheries to prevent spread of this infection.

Any one of the following methods may be used in officially testing chickens for pullorum disease: (1) The tube agglutination test, (2) the stained antigen, rapid, whole-blood test, and (3) the rapid serum test.

The number of States with official testing programs and the volume of testing have increased rapidly since the National Poultry Improvement Plan became operative. During the seventh year of the operation of the plan (1941-42) the number of breeding birds officially tested was nearly as large as the total number of birds officially tested during the 15 years preceding operation of the plan. The percentage of reactors in officially conducted tests is continuing to be reduced with each successive year of testing.

In a great many States only those birds that are officially tested for pullorum disease are eligible for participation in the breeding stages of the plan. This will be a requirement in all the States after September 1, 1943.

Any one of the following methods may be used in testing chickens for pullorum disease: (1) Tube agglutination test, (2) stained-antigen, rapid, whole-blood test, and (3) rapid serum test. The plan provides four progressive pullorum classes, each having successively higher requirements in the following order: (1) U. S. Pullorum-Tested, (2) U. S. Pullorum-Controlled, (3) U. S. Pullorum-Passed, and (4) U. S. Pullorum-Clean.

U. S. PULLORUM-TESTED CLASS

All chickens 5 months of age or older to be retained as breeders are tested by a State pullorum tester or pullorum-testing agent and the reactors removed from the premises on completion of the test.

When the plan was first set up it was only necessary to test the birds in a breeding flock for pullorum disease and remove the reactors in order for the flock to qualify as U. S. Pullorum-Tested. There was no maximum percentage of reactors above which retests were required. Following the first year of operation, and continuing through 1940-41, the maximum tolerance for U. S. Pullorum-Tested flocks was less than 10 per cent. Flocks containing 10 per cent or more reactors on the first test were either rejected or required to be retested not sooner than 30 days after the first test and have less than 10 per cent reactors before being able to qualify for this class. Starting in 1941-42 the maximum number of reactors permitted on the first test was less than 9 per cent. The tolerance is being reduced 1 per cent each year until in 1945-46 and thereafter it will be less than 5 per cent. Testing work is done within 12 months immediately preceding the date of sale of hatching eggs or chicks. All chickens introduced into breeding flocks at any time must be tested and be negative to the test.

U. S. PULLORUM-CONTROLLED CLASS

The requirements for this class are the same as for U. S. Pullorum-Tested, except that the number of reactors on the last test must be less than 2 per cent.

U. S. PULLORUM-PASSED CLASS

All chickens to be used as breeders shall be tested when more than five months of age. U. S. Pullorum-Passed flocks do not contain any reactors on the last test made within the testing year immediately preceding date of sale of hatching eggs, chicks, or breeding stock. Birds introduced into the flocks are from U. S. Pullorum-Passed or U. S. Pullorum-Clean flocks.

U. S. PULLORUM-CLEAN CLASS

All chickens over 5 months of age to be retained as breeders in Pullorum-Clean flocks are tested annually. Flocks to be so designated must not contain reactors in either of two consecutive tests not less than 6 months apart, or in three consecutive tests not less than 30 days apart, the last test being made within the testing year immediately preceding the date of sale of hatching eggs, chicks, or breeding stock. Birds introduced into the flocks must be from only U. S. Pullorum-Clean flocks.

THOSE WHO WILL BENEFIT BY THE PLAN

The National Poultry Improvement Plan is based on tried breeding and pullorum-control practices that, over a period of years, have demonstrated their value in improving the breeding and production qualities of poultry and reducing losses from pullorum disease. Therefore its extensive and efficient operation over a sufficient period of years should greatly benefit the entire industry and the consumers of poultry products.

The principal benefits to be derived by buyers of chicks and breeding stock are (1) a consistent improvement in stock, leading to a more efficient production of better quality poultry products; (2) decreased mortality in chick and adult flocks, resulting from pullorum-disease control and better flock and hatchery sanitary practices; and (3) adequate information concerning the quality of stock available, so that it may be bought with confidence and with greater assurance of being the quality desired.

Flock owners who produce hatching eggs may expect (1) improvement of their own breeding flocks through selection, pullorum control, and suggestions as to the best

management practices; and (2) availability of better foundation stock for the improvement of their flocks.

Hatcherymen receive aid in numerous ways such as (1) official certification of the quality of products which they produce; (2) identification of good foundation male stock for their hatching-egg flocks; (3) better cooperation from their hatching-egg producers; (4) education of the poultry public regarding the quality and soundness of their production program; and (5) simple and essential records useful in the efficient and profitable operation of their business.

Poultry breeders doing trap-nesting and pedigree breeding are aided (1) in developing sounder breeding programs, (2) in obtaining the most satisfactory type of forms for keeping records of all breeding operations and results, and (3) in the certification of their stock on the basis of its merit.

Evidence of the value of advanced breeding work from the standpoint of egg production is illustrated in the following data:

Average annual egg production per laying hen on farms in United States, 1941..	110
Average annual egg production of pedigreed U. S. R. O. P. candidates, 1940-41 (trap-nest record year)	171
Average annual egg production of daughters of U. S. R. O. M. sires, 1940-41....	198
Average annual egg production of daughters of U. S. R. O. M. dams, 1940-41....	207

Marketing agencies and the consuming public also benefit materially from the greater uniformity and superior quality of eggs and poultry meat resulting from the cooperation of the breeder and hatchery industry in the national plan.

National Turkey Improvement Plan.—The National Turkey Improvement Plan, providing for both breed improvement and pul-lorum disease control similar to the plan for chickens, was inaugurated in 1944. Details can be obtained from the official state agency or from the U. S. Department of Agriculture.

VIII

CROSSBRED CHICKS

THE PRODUCTION of crossbred chicks by the use of male and female parents of different breeds or varieties began to attract considerable attention along about 1930 and 1931. This interest was due largely to the remarkable results obtained with hybrid corn and also to the fact that crossbreeding of poultry experimentally had often resulted in (1) increased hatchability, (2) higher chick livability, (3) more rapid and more economical growth, (4) increased egg production, (5) less adult mortality, and (6) made possible, by the use of certain crosses, the identification of chicks at hatching time.

The crossing of a horse and an ass results in the mule, and the mule's reputation for toughness and hardiness is well-known. From the knowledge of the unusual vigor and vitality resulting from the crossing of different breeds and varieties in other forms of livestock, many people have concluded that crossing of anything must be good. Crossbred chicks have increased in popularity partly because of merit and partly because of promotion. Some crosses have considerable merit, while others are used mainly for sales and advertising purposes.

At the present time in this country, crossbreds are used more often for broilers than for egg production, although quite a lot of the crossbred pullets are kept for layers in some areas. In England, crossbreds have been used for egg production for some time. As far back as 1928-29 in the National Egg Laying Contest of the British Isles, the average egg production for 156 crossbreds was 207.5 eggs; White Leghorns, 191.8; Rhode Island Reds, 186.8; and White Wyandottes, 185.9. In this country, however, crossbreds in egg laying contests have not finished anywhere near as well as the best purebreds.

Crosses Used.—All types of crosses are now being used. Every so often, someone comes out with a new one with a catchy name

which is claimed to have all the advantages and none of the disadvantages of other crosses. Without a doubt, however, the cross of Barred Rock and Rhode Island Red or New Hampshire is the more popular, since in many areas it is used for broilers almost exclusively. In the Del-Mar-Va area along the Eastern Coast, it is said that a very high percentage of the chicks are crossbreds and they are almost entirely of this cross. In New England this cross is used almost altogether, many of the eggs and chicks going to the broiler areas of the Del-Mar-Va peninsula.



Fig. 59.—These are the chicks produced when Barred Plymouth Rock hens are crossed with Rhode Island Red cockerels. Notice the white crown spot on each of the male chicks in the basket at the left. The female chicks, shown in the basket at the right, are entirely black and do not have this spot. (*Storrs Agr. Expt. Sta. Photo.*)

The popularity of the various crosses, however, will vary with different localities. Where a white broiler is desired, few of the Barred-Red cross will be found. In Kansas, the Australorp-Leghorn cross is popular, but is not used much in other states. A cross of New Hampshire females and White Wyandotte males is used in some areas because of the light plumage. White Rocks and Leghorns are frequently crossed, and the Cornish is used to some extent with either Leghorns or heavy breeds in some areas. The White Rock-Wyandotte cross is often used where white chicks are desired.

Warren (1942) made a survey among hatcheries and received 54

TABLE XV.—TYPES OF CROSSES OF CHICKENS LISTED BY HATCHERYMEN IN THE ORDER OF THEIR USE, TOGETHER WITH UNFAVORABLE COMMENTS REGARDING THEM
(Warren—1942)

BREEDS CROSSED (Male parent listed first)	Number times listed	Unfavorable comments on—									
		Size	Plumage color	Leg color	Egg- shell color	Skin color	Broodi- ness	Fer- tility	Growth	Feath- ering	General traits
Australorp × W. Leghorn.....	35	.....	.....	2	1	1	5	2	.....	.....	.....
R. I. Red × B. P. Rock.....	18	.....	7	.....	.....	.....	1	.....	.....	.....	.....
W. P. Rock × W. Leghorn.....	18	1	.....	.....	1	.....	.....	.....	1	.....	.....
W. Leghorn × W. P. Rock.....	15	2	.....	.....	.....	.....	1	3	.....	.....	.....
Blk. Minorca × W. Leghorn.....	14	1	1	.....	.....	.....	1	.....	.....	.....	.....
B. P. Rock × R. I. Red.....	10	.....	1	.....	.....	.....	.....	.....	.....	2	.....
R. I. Red × W. Wyandotte.....	10	.....	3	.....	.....	.....	.....	.....	.....	.....	.....
New Hampshire × B. P. Rock.....	8	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Dark Cornish × R. I. Red.....	7	.....	.....	.....	.....	.....	.....	1	.....	2	.....
W. Leghorn × R. I. Red.....	7	1	1	.....	.....	.....	.....	2	.....	.....	.....
R. I. Red × W. Leghorn.....	6	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
W. Minorca × W. Leghorn.....	5	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
Dark Cornish × W. Leghorn.....	5	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
W. Leghorn × New Hampshire.....	4	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
W. Leghorn × B. P. Rock.....	3	.....	.....	.....	.....	.....	.....	1	.....	.....	.....

replies, about half from Kansas and the remainder from Alabama, Illinois, Indiana, Iowa, Michigan, Missouri, New Hampshire, Ohio, and Oklahoma. The results appear in Table XV.

Hatchability.—In general, improved hatchability results from crossing, but this is not always the case. For instance, Knox, Quinn, and Godfrey (1943) found that crossbreds were no better than the standardbred Rhode Island Reds used in the crosses involving Reds; White Wyandottes, and Light Sussex.

Warren (1927), in crosses of Leghorns and Jersey Black Giants, secured better hatchability in the crosses than in the purebreds of either breed. Warren (1942) after a series of experiments concluded that crossbreeding does stimulate hatchability, but that if one of the purebreds used has exceptionally high hatchability, there will be little room for improvement when using it in crossbred matings. He says that hatcherymen are of the opinion that using the smaller Mediterranean males with larger breed females when the cross is made of light and heavy breeds tends to increase fertility.

Horlacher, Smith, and Wiley (1941) in a series of experiments involving many different crosses, but with relatively few eggs in many cases, found that the crossbreds in general surpassed the purebred parents.

It seems, therefore, that better hatches are likely to be secured with crossbreds, but there are many cases where this will not be true, especially where one of the purebred parents is of an odd breed or variety in which hatchability often tends to be low. Some have had this experience when Cornish is one of the parents. Increased hatchability, of course, means lowered chick cost. In producing crossbreds, this point should be taken into consideration.

Chick Mortality.—Chick mortality is one of the many costs in rearing chicks either for broilers or pullets for laying purposes and if crossbreds show less mortality, other things being equal, it is certainly a point in their favor.

Crossbreds consistently showed a lower mortality than purebreds in the experiments conducted by Warren (1930). Results in one trial appear in Table XVII.

Warren (1942) in later experiments also found a tendency for crossbreds to show a lower mortality, although where the mortality rate already was low in purebreds, there was little room for improve-

ment. Horlacher, Smith, and Wiley (1941) found a tendency for the crossbreds to live better. Poffenberger and DeVault (1937) in a study of the broiler industry in Maryland where a large number of crossbred broilers are used, found that there was a slightly lower mortality in crossbreds than in purebred Barred Rocks.

TABLE XVII.—CHICK MORTALITY OF CROSSBREDS AND PUREBREDS COMPARED
(Warren—1930)

	Per Cent Mortality
White Leghorns	6.04
Rhode Island Reds	7.03
Leghorn male X Red female	3.09
Red male X Leghorn female	0.06

In chicks free of pullorum disease or where the amount of infection is so low that little trouble is experienced with losses from this cause and where brooding conditions are good, chick mortality, as a rule, is so low that not too much should be expected of crossbred chicks. But where brooding conditions are not too good, or where the chicks are crowded, or where pullorum disease is somewhat of a problem, it is quite possible that crossbred chicks, due to their increased hybrid vigor and vitality, may be able to stand more punishment and, hence, show lower chick mortality than purebreds. Certainly, the evidence tends to show that crossbreds under most conditions can be expected to live slightly better.

Rate of Growth.—Most authorities are agreed and it is generally conceded that the greatest gains to be secured from crossbreds are for broiler purposes where the proper crosses are made. It cannot be concluded from this, however, that all crosses are better than the best purebreds.

Poffenberger and DeVault (1937) give data in Table XVIII of the Barred Rock versus the Red-Rock cross as secured in a study of the broiler industry in Maryland.

Hess, Byerly, and Jull (1941) experimenting with Barred Rocks, New Hampshires, and the Barred Rock-New Hampshire cross, report that crossbreds in general are more efficient than purebreds in the utilization of feed. Knox, Quinn, and Godfrey (1943) in experiments already referred to earlier with Rhode Island Reds, White Wyandottes, and Light Sussex, conclude that in general the progeny

of two and three-way crosses were superior to the progeny of pure-bred Rhode Island Reds in rate of growth to 10 and 20 weeks of age.

TABLE XVIII.—BARRED ROCK VERSUS RED-ROCK CROSS BROILERS—1934-35 AVERAGE
(Poffenberger and DeVault—1937)

Item	Crossbred	Straight
Number of birds raised	829,289	630,983
Number of farms	84	87
Per cent mortality	14.0	18.1
Cost per bird, cents:		
Fuel	2.3	2.4
Feed	25.9	26.1
Labor	4.4	4.1
Cost of chicks	13.0	10.1
Total expense per bird, cents ¹	55.9	52.5
Amount of mash consumed per bird, lbs.	8.44	8.40
Amount of grain consumed per bird, lbs.	2.43	1.64
Total grain and mash consumed per bird, pounds.....	10.87	10.04
Amount of grain and mash to produce one pound of poultry, lbs.	3.83	4.10
Age broilers are sold, weeks	12.6	13.7
Weight per bird when sold, lbs.	2.84	2.45
Total income per bird, cents ¹	67.0	51.1
Price received per pound, cents ²	21.9	20.3
Net return per bird, cents ¹	11.1	—1.4

¹ Based on the number of birds raised.

² Based on the number of birds sold.

Warren (1942) concludes that up to the 6-week age crossbreds are usually of more rapid growth than the purebreds from which they came; where the smaller Mediterraneans are crossed to larger breeds, the crossbreds are usually intermediate in size after the 8-week age; the crossing of two larger breeds usually produces crossbreds which outgrow the parent stock at all ages.

Horlacher, Smith, and Wiley (1941), on the other hand, in experiments involving ten crosses and one reciprocal cross, found that where two heavy breeds were crossed, the crossbreds usually grew more rapidly than did the parent stock, but conclude that apparently for Arkansas conditions, the results do not justify the recommendation of any of the crosses involved in their study for commercial broiler production. Their experiments did not include the Barred Rock-Rhode Island Red or New Hampshire cross so popular in many areas.



Fig. 60.—Cockerel from a cross between a Rhode Island Red male and a Barred Plymouth Rock hen.
(*Storrs Agr. Expt. Sta. Photo.*)

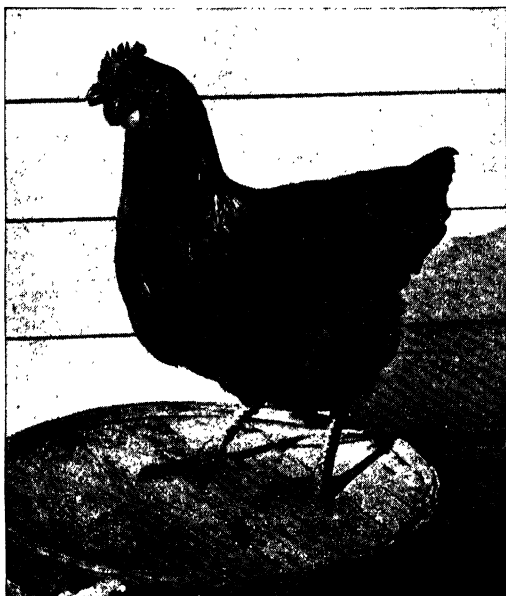


Fig. 61.—Pullets from the Red-Rock cross are predominantly black with some bronze coloring, generally around the neck and head.

The data and experiments to date would seem to warrant the conclusion that for broiler purposes, crosses of heavy breeds are generally justified, but that many crosses are not as good as purebreds especially when smaller breeds such as Leghorns are used as part of the cross.

Egg Production.—The case for crossbreds on egg production is not as good as it is for broilers. In this country very few of the crossbreds entered in egg laying contests have approached the records of the purebreds. This in itself is not positive proof, because possibly the parents of the crossbreds were not as good as the best of the purebreds, but it is evidence, at least, that not all crossbreds are good layers as so many people would have you believe.

Warren (1930) in his experiments obtained the following egg production averages for the pullet year: White Leghorns, 211.6 eggs; Rhode Island Reds, 168.9 eggs; Leghorn male X Red female, 214.6 eggs; and Red male X Leghorn female, 198.7 eggs.

It will be observed that the crossbreds outlaid the pure Reds, but that they were about the same as the pure Leghorns. Since the pure Reds had much lower records than the Leghorns, it is safe to assume that there was some advantage in crossing, otherwise the crossbreds would have averaged less eggs than the Leghorns. It also brings out the fact that there is not much advantage in using Leghorns with a heavier breed, if the egg producing qualities of the heavier breed are considerably below the Leghorns.

Warren (1942) in later experiments found that the egg production of crossbreds was equal to or better than that of the better producing purebred parent, but that not all crossbreds were superior producers. Knox, Quinn, and Godfrey (1943), in experiments already referred to, found that crossbreds were no better than the standardbred Rhode Island Reds.

From the somewhat limited data available, it appears that when two breeds of good egg producing strains are crossed, there may be some gain in egg production, but that when one of the parents is from a poor producing strain, there is not much to be gained, if any, in comparison with the best parent stock. It would appear, furthermore, that in many crosses now being used, the parent stock is known to be of poor producing ability, because in some of the breeds there are no high producing strains and the use of such stock in

crosses can hardly be justified in comparison with good producing strains of some of the more popular and common purebreds from the standpoint of egg production.

It would seem therefore that while there are some benefits in crossing under certain conditions, it would also appear that the proper selection of good parent stock is necessary, if the greatest benefits are to be secured.

Adult Mortality.—Adult mortality is one of the most serious problems of the poultry industry today, largely due apparently to the increased deaths in recent years from fowl paralysis complex, although many other troubles contribute to this high mortality rate. Many people have been led to believe that the use of crossbreds will eliminate most of their adult mortality.

Warren (1942) found that there was no striking reduction in pullet mortality as a result of crossbreeding and states that it would appear that the major causes of pullet mortality (probably because of the paralysis complex) were of a nature that increased vigor as evidenced in other characteristics, was of no protection to the bird. Knox, Quinn, and Godfrey (1943) found that the F¹ hybrids had an average of 6 to 10 per cent better livability for the three years of their experiments and the progeny of the three-way crosses was approximately 15 per cent better than the Rhode Island Reds used in the crosses.

From the limited data available on this point, it is not clear just what can be expected from crossbreds in the way of reducing adult mortality.

Other Factors.—As to rate of maturity, the evidence is not clear-cut. Warren (1942) found that where late and early maturing strains or breeds were crossed, the more frequent result was maturity similar to the earlier maturing breed or intermediate. The crossing of two large breeds resulted in crossbreds which were only slightly earlier than the purebreds. Warren (1930) found that maturity was lessened more when the Leghorn male was used, indicating that this factor or combination of factors is at least partially sex-linked. Hays (1924) also has shown that differences in maturity age are due to sex-linked factors.

Crossbreds very often show more broodiness than either parent and rarely less than either parent.

On egg weight, the evidence is not clear. Warren (1942) states that the more frequent result was for the crossbreds to be more like the larger than the smaller of the two parents in egg weight, but in some cases they were like the smaller parent. Knox, Quinn, and Godfrey (1943) state that the crossbreds were no better than the standardbred Rhode Island Reds in egg weight.

Egg color is almost always intermediate in color between the color produced by the two parents. In areas where white eggs bring a premium, this is an important point and crosses of Leghorns and heavy breeds will likely not be very popular for egg production.

The adult weight, when light and heavy breeds are used, is usually intermediate between the two parents. When two breeds of about equal size are crossed, apparently the crossbreds are little different than the parents.

CROSSBREEDING FOR SEX DISTINCTION

Before sexing of chicks by examination for the presence or absence of the male organ came into use, it was believed that crossing of breeds in such a way as to distinguish the sex of the chicks at hatching time by color markings would be of great benefit, but this did not prove to be the case. It is possible that this phase of crossbreeding, which is discussed in Chapter XIV, may become more widespread in the future.

HYBRIDS

The term, "hybrids," while often loosely used, is now understood as the crossing of closely inbred lines of different breeds. Hybrid chicks are being produced on a limited scale by a few breeders and hatcheries. Some breeders supply hatcheries with female chicks of one inbred line of one breed and male chicks of another. When mature, they are crossed to produce hybrid chicks. •

Where the inbreeding is carefully and capably done, such hybrids have some possibilities. Proper inbreeding, however, is a long, costly, and tedious process, requiring rigid selection and the elimination of large numbers of birds and families in order to secure the proper inbreds for crossing.

IX

GETTING HATCHABLE EGGS

HATCHABILITY, meaning the number of chicks secured per 100 eggs set, is one of the most important factors determining profits. Since egg cost is the largest single item in the cost of producing chicks, the difference between profits and losses for the season may be in the way the eggs hatch. The hatcheryman cannot improve the eggs after he receives them. Wise and intelligent hatcherymen and breeders spend considerable time and effort in seeing that they get good eggs.

There are two phases of this problem—fertility and hatchability. Many so-called infertile eggs are really fertile eggs that die the first or second day of incubation and are classed as infertile because the dead embryo cannot be detected by candling.

FERTILITY

Causes of Poor Fertility.—Failure of eggs to be fertile may be the result of many different causes, some of which are fairly well known, but there is still much to be learned on this subject. There is some evidence to indicate that low fertility may be inherited, but the evidence is very incomplete. Among some of the causes of poor fertility are:

1. *Weather.*—Fertility usually drops for several days during severe cold or hot spells, the extent varying with the severity of the weather. When so cold that the combs and wattles of the males are frozen, the drop in fertility is worse.

2. *Age of birds.*—Ordinarily the older the breeding birds, the lower the fertility. For this reason, chicks from old hen matings generally cost more to produce. Even the use of cock birds with pullets often results in lower fertility than when all cockerels are used. Excessively long spurs on old males may hinder mating. Such spurs should be trimmed before the males are put in the flocks.

3. *Too few or too many males.*—In flock matings, one male for 12 to 20 females in heavy breeds, and for 15 to 25 in Leghorns and other light breeds, is generally accepted to be about the right proportion. Poor fertility may result, especially in the case of old males, if these proportions are varied by having more females. If too many males are present, especially when the breeders are confined, constant fighting may result in lowered fertility.

4. *Preferential mating.*—In single matings, certain males and females may not mate, but this will not be a problem in ordinary flocks where several males are present.

5. *Deficiency in the ration.*—Card, Mitchell, and Hamilton (1931) found that lack of vitamin E in the ration resulted in very low fertility, or none at all, but since this vitamin is present in practically all rations, poor results are seldom due to it. The use of expensive vitamin E concentrates in the form of wheat germ oil is seldom justified according to Holmes and Cravens (1940).

6. *Use of eggs too soon after placing males in flock.*—Fertile eggs have been known to be produced as soon as 20 hours after mating, but it is not safe to save eggs until a week or 10 days after males have been placed in the flock; even longer is desirable in extremely cold weather. Fertile eggs have been produced for as long as 30 days after males were removed, but for only a very few days is it safe to use eggs after males have been removed.

It quite often happens that fertility will start dropping in some flocks along in mid-April and continue to drop very slowly during the remainder of the season. This, in some cases, may be due to the males because a few people who have replaced the males at this time have reported an immediate improvement. For hatcheries that hatch only until late May or early June, it is very questionable whether replacement males should be held over for use for such a short period due to the cost of such a procedure.

For those hatching during the summer and fall, however, Hogue and Schnetzler (1937) report that better fertility* may be secured by using early hatched cockerels to replace old males which are likely to be molting and not giving satisfactory fertility.

Nalbandov and Card (1943) have shown that while stale sperm retain their ability to fertilize eggs the proportion of eggs that fail to hatch increases with the age of the sperm. They suggest that the

unpopularity of some individual hens with males combined with insufficient males may cause some hens to lay fertile eggs which are incapable of hatching because the males mate with these particular hens so seldom that the eggs are fertilized by stale sperm. They also found that warming eggs daily while they were held for hatching, to correspond with the hen setting on the eggs each day while a clutch was being laid, did not result in any improvement in fertility or hatchability.

Stale sperm may also possibly explain why hatchability drops during sudden cold snaps. During these spells the males do not mate as often, which means that the sperm in the oviduct may be somewhat older than normal when the eggs are fertilized.

FACTORS AFFECTING HATCHABILITY

Breeding.—There is considerable experimental evidence to show that hatchability is inherited and that there are good possibilities of establishing high hatching strains. From 1922 to 1925, not over 3 per cent of the Rhode Island Red breeders on the Massachusetts State College farm had hatchability records of 85 per cent or better, but by using males from dams having 85 per cent or better hatcha-

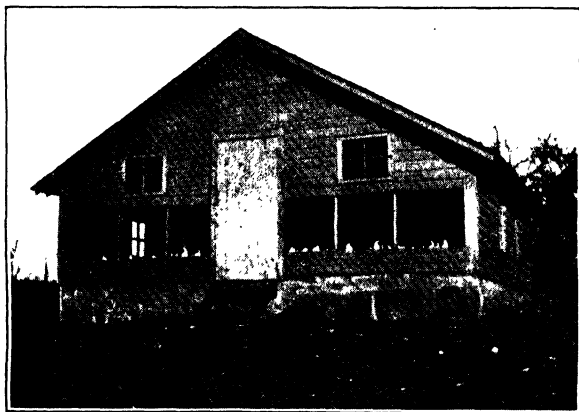


Fig. 62.—Good housing will help to prevent outbreaks of disease which invariably result in poorer hatchability.

TABLE XIX.—EGG COST PER 100 CHICKS AT DIFFERENT LEVELS OF HATCHABILITY.
(1943 Standard Directory & Buyer's Guide—Poultry Supply Dealer)

Price Paid Per Doz. Eggs	Percentage Hatch									
	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
15¢	\$ 3.57	\$3.13	\$2.78	\$2.50	\$2.27	\$2.08	\$1.92	\$1.79	\$1.67	\$1.56
16¢	3.80	3.33	2.96	2.66	2.42	2.22	2.05	1.90	1.77	1.66
17¢	4.06	3.55	3.16	2.84	2.58	2.37	2.18	2.03	1.89	1.78
18¢	4.29	3.75	3.33	3.00	2.73	2.50	2.31	2.14	2.00	1.88
19¢	4.51	3.95	3.51	3.16	2.87	2.63	2.43	2.26	2.11	1.98
20¢	4.77	4.18	3.71	3.34	3.04	2.78	2.57	2.39	2.23	2.09
21¢	5.00	4.38	3.89	3.50	3.18	2.92	2.69	2.50	2.33	2.19
22¢	5.23	4.58	4.07	3.66	3.33	3.05	2.82	2.61	2.44	2.29
23¢	5.49	4.80	4.27	3.84	3.49	3.20	2.95	2.74	2.56	2.40
24¢	5.71	5.00	4.44	4.00	3.64	3.33	3.08	2.86	2.67	2.50
25¢	4.94	5.20	4.62	4.16	3.78	3.47	3.20	2.97	2.77	2.60
26¢	6.20	5.43	4.82	4.34	3.95	3.62	3.34	3.10	2.89	2.71
27¢	6.43	5.63	5.00	4.50	4.09	3.75	3.46	3.21	3.00	2.81
28¢	6.66	5.83	5.18	4.66	4.24	3.88	3.58	3.33	3.11	2.91
29¢	6.91	6.05	5.38	4.84	4.40	4.03	3.72	3.46	3.23	3.03
30¢	7.14	6.25	5.56	5.00	4.55	4.17	3.85	3.57	3.33	3.13
31¢	7.37	6.45	5.73	5.16	4.69	4.30	3.97	3.69	3.44	3.23
32¢	7.63	6.68	5.93	5.34	4.85	4.45	4.11	3.81	3.56	3.34
33¢	7.86	6.88	6.11	5.50	5.00	4.58	4.23	3.93	3.67	3.44
34¢	8.09	7.08	6.29	5.66	5.15	4.72	4.35	4.04	3.77	3.54
35¢	8.34	7.30	6.49	5.84	5.31	4.87	4.49	4.17	3.89	3.65
36¢	8.57	7.50	6.67	6.00	5.45	5.00	4.62	4.29	4.00	3.75
37¢	8.80	7.70	6.84	6.16	5.60	5.13	4.74	4.40	4.11	3.85
38¢	9.06	7.93	7.04	6.34	5.76	5.28	4.88	4.53	4.23	3.96
39¢	9.29	8.13	7.22	6.50	5.91	5.42	5.00	4.64	4.33	4.06
40¢	9.51	8.33	7.40	6.66	6.05	5.55	5.12	4.76	4.44	4.16
41¢	9.77	8.55	7.60	6.84	6.22	5.70	5.26	4.89	4.56	4.28
42¢	10.00	8.75	7.78	7.00	6.36	5.83	5.38	5.00	4.67	4.38
43¢	10.23	8.95	7.96	7.16	6.51	5.97	5.51	5.11	4.77	4.48
44¢	10.49	9.18	8.16	7.34	6.67	6.12	5.65	5.24	4.89	4.59
45¢	10.71	9.38	8.33	7.50	6.82	6.25	5.77	5.36	5.00	4.69
46¢	10.94	9.58	8.51	7.66	6.96	6.38	5.89	5.47	5.11	4.79
47¢	11.20	9.80	8.71	7.84	7.13	6.53	6.03	5.60	5.23	4.90
48¢	11.43	10.00	8.89	8.00	7.27	6.67	6.15	5.71	5.33	5.00
49¢	11.66	10.20	9.07	8.16	7.42	6.80	6.28	5.83	5.44	5.10
50¢	11.91	10.43	9.27	8.34	7.58	6.95	6.42	5.96	5.56	5.21
51¢	12.14	10.63	9.45	8.50	7.73	7.08	6.54	6.07	5.67	5.31
52¢	12.37	10.83	9.62	8.66	7.87	7.22	6.66	6.19	5.77	5.41
53¢	12.63	11.05	9.82	8.84	8.04	7.37	6.80	6.31	5.89	5.53
54¢	12.86	11.25	10.00	9.00	8.18	7.50	6.92	6.43	6.00	5.63
55¢	13.09	11.45	10.18	9.16	8.33	7.63	7.05	6.54	6.11	5.73
56¢	13.34	11.68	10.38	9.34	8.49	7.78	7.18	6.67	6.23	5.84
57¢	13.57	11.88	10.56	9.50	8.64	7.92	7.31	6.79	6.33	5.94
58¢	13.80	12.08	10.73	9.66	8.78	8.05	7.43	6.90	6.44	6.04
59¢	14.06	12.30	10.93	9.84	8.95	8.20	7.57	7.03	6.56	6.15
60¢	14.29	12.50	11.11	10.00	9.09	8.33	7.69	7.14	6.67	6.25

bility, the hatchability was greatly increased. In 1931, some 52 per cent of the Red breeders on the college farm had hatchability records of 85 per cent or better.

Inbreeding of close relatives will invariably result in poor hatchability. By close inbreeding of Rhode Island Reds in work at the Wisconsin Experiment Station, the hatchability was reduced from 67 per cent to 18 per cent in a period of four years. Inbreeding, however, is not likely to be troublesome in the average hatchery flock, especially if outside blood is introduced every third year or so.

It has been proven in many experiments that there are several lethal hereditary factors causing death of the developing chicks before the end of the incubation period. Many of these factors have been reviewed by Landauer (1937) and they undoubtedly are responsible for the poor results repeatedly secured from the eggs from certain flocks.

When certain flocks are consistently low in hatchability, it is best to discard these flocks and supply the flock owners with chicks from a flock having a record of high hatchability.

Egg Size and Shape.—There is considerable experimental evidence, Landauer (1937), Funk (1934), Warren (1934), and it is a common observation of hatcherymen and breeders, that large egg size and decreased hatchability go together. The data, however, does not show that small egg size and increased hatchability go together but rather tends to show little difference between medium and small egg size in this factor. In the craze for large eggs, breeders and hatcherymen should keep that point in mind.

Little connection between egg shape and hatchability has been found except, of course, that abnormally long and narrow or short and round eggs rarely hatch.

Shell Texture.—Shell texture is generally presumed to greatly affect the hatchability of eggs, and eggs clearly abnormal in this respect undoubtedly do hatch poorer due to greater porosity of the shell. But there is considerable doubt as to whether the naked eye is not often deceived regarding shell texture and porosity.

Funk (1934) candled eggs prior to incubation and separated those that appeared mottled and which are generally presumed to be more porous, but he found that these mottled eggs hatched as well as the so-called normal or unmottled eggs. Naturally, any eggs that are

undesirable from a market standpoint should not be used for hatching, but it is doubtful if the poor hatching eggs can be identified because they "look" porous.

Age of Breeding Birds.—Hatcherymen and breeders generally find that they get poorer hatchability from hens than pullets and, consequently, generally charge slightly more for chicks from flocks of all old hens than from all pullets or a mixture of hens and pullets. Most of this lower hatchability is undoubtedly due to poorer fertility and a small part possibly to lower hatching power of fertile eggs. Funk (1934) and Warren (1934) in their work, and some other data as reported by Landauer (1937), found that pullet eggs gave better results generally than hen eggs so far as hatchability was concerned.

Effect of Previous Egg Production.—There still exists to some extent the opinion that heavy fall and winter egg production prior to the hatching season injures the birds so that their vigor is impaired, resulting in eggs that fail to hatch well during the regular hatching season, or if they do hatch, produce weak chicks. This was, no doubt, true before much was known about feeding and vitamins and exists even today where flocks are confined and improperly fed. There is a considerable volume of careful research work, however, to show that where an adequate ration is fed, there is no connection between the previous egg production and the hatchability. Among such data is that of Jull (1928), Knox (1927), Atwood (1927), Funk (1934), Warren (1934), Landauer (1937). Jull and Funk both report that heavy egg production during the spring is apparently conducive to or at least associated with high hatchability.

It would seem, therefore, that flock owners can secure good fall and winter egg production without injuring the flocks as breeding flocks, provided they are careful to feed a complete ration. There is, of course, some advantage from the viewpoint of egg size and, hence, chick size in having the flock in production for some time prior to the use of the eggs for hatching, otherwise the pullet eggs may be too small for setting.

Lamoreux (1941) found fertility was not injured by high egg production; in fact, fertility was slightly better when egg production was higher. He also found that birds mated less frequently when rate of egg production was low and that fertility lasted a shorter

time after mating. These two factors apparently are responsible for infertility during periods when production is low.

Feeding and Hatchability.—Feeding has a tremendous influence on the hatchability. Flocks can be so fed and managed that not a single egg will hatch, as demonstrated by Hart (1925) and associates at the University of Wisconsin. If eggs are fertile, but fail to hatch, it is obvious then that the reason is that the embryos die sometime during the process of incubation. This embryo mortality may be due to improper and inadequate rations of the breeding flocks.

TABLE XX.—THE EFFECT OF COD LIVER OIL AND CEL-O-GLASS ON HATCHABILITY
(Ohio Experiment Station)

Month	Basal Ration (Window Glass)		Basal Ration (Cel-O-Glass)		Basal Ration plus 2% Cod Liver Oil	
	No. Eggs Set	% Fertile Eggs Hatched	No. Eggs Set	% Fertile Eggs Hatched	No. Eggs Set	% Fertile Eggs Hatched
January ..	141	65.1	119	73.5	131	73.4
February .	190	48.6	365	65.7	397	75.3
March ...	118	27.0	406	63.5	418	64.6
April	89	16.2	380	64.1	318	61.2
May	36	0.0	410	62.5	383	60.5

Basal ration contained alfalfa meal.

In recent years, we have learned a great deal about vitamins and their importance in producing good hatching eggs. It is important that a hatcheryman know what vitamins are needed, in what amounts, and in what feeds they are present so that he can properly advise and supervise his flock owners. Also, the importance of vitamins to the growing chick makes it important that he know these requirements for chicks in order to intelligently advise chick customers. For this reason, a chart prepared by Norris (1946) of Cornell University is reproduced as Table XXI.

Because of the complexity of the feeding problem, we can discuss it here only briefly and bring out only some of the more important points.

Sunshine and Vitamin D.—To get good results, the breeders either must be in the sunshine or get vitamin D in the form of vitamin fish oils or D-activated animal sterols in the feed. Sunshine coming through ordinary window glass will not suffice. If the birds

are confined and dependence is to be placed on sunshine, a good glass substitute, which will permit the ultra violet rays of the sun to penetrate to the birds, should be used. Open range, where the weather permits, will make it unnecessary to feed a vitamin D supplement although in many sections sunshine is such an uncertain factor in the winter that vitamin D preparations should be fed as a safety factor. Several experiments have shown that good results will be obtained when the breeders are on range if green feed is available.

Without sunshine or some vitamin D supplement, egg production decreases, hatchability decreases, egg shells become weak and break easily, and chick mortality is very heavy in those that do hatch. Byerly (1931) has shown that a vitamin D deficiency is one of the causes of "sticky" chicks at hatching time.

Vitamin G.—It has long been known that milk and green feed were desirable for layers, but for many years, no one knew the exact reason. Research work has shown this factor to be vitamin G, or riboflavin, and it is absolutely necessary that the breeding flock secure it in sufficient amounts if good hatchability is to be secured. The most common sources of this factor are milk and milk by-products, green grass, and alfalfa leaf meal. Bethke (1939) reported that vitamin G requirements will be met for hatchability purposes if 5 per cent of a good grade of milk, or its equivalent, and 5 per cent of a high quality alfalfa meal are used in the ration.

The presence of this vitamin in green grass explains why the eggs from flocks running outdoors on green grass usually hatch well and why hatcherymen for years have preferred to have their breeding flocks on range. This fact also explains why, with a large number of flock owners, some who feed complete rations, but many who do not, it is a safety measure and a form of insurance to have the flocks outdoors as much as possible during good weather where they can eat grass, be in the sunshine, and thus have nature provide the vitamins that are lacking in so many rations.

When the wartime shortages of milk for poultry feeding occurred, it was feared that hatchability would be seriously affected, but widespread use of synthetic riboflavin obtained as a by-product of the distilling industry assured poultry raisers of ample vitamin G, and hatchability actually improved in spite of the lack of various ingredients that ordinarily went into poultry feeds.

TABLE XXI.—VITAMINS NEEDED BY CHICKENS
(Norris—1946)

Letter designation	Popular name	Important functions	Chief sources	Quantity required per pound of ration ¹	
				Chicks ²	Layers and breeders
Vitamin A	Chemically identified but not yet named (Carotene and cryptoxanthin are precursors.)	Preserves health of eyes, nervous tissue and epithelium of respiratory organs, intestinal tract, etc. Prevents xerophthalmia, staggering gait and congestion of urates in kidneys.	Yellow corn, corn gluten meal, alfalfa meal, cereal grass, green pasture, fish oils.	1200 U. S. P. units	3300 U. S. P. units.
Vitamin B(B ₁)	Thiamin	Necessary for maintenance of appetite. Preserves health of nervous tissue. Prevents polyneuritis.	Grains, rice by-products, wheat by-products, yeast, alfalfa meal, green pasture, milk products.	900 micrograms	Undetermined
Vitamin B ₆	Pyridoxine	Necessary for growth and maintenance of appetite. Prevents convulsions.	Grains, wheat by-products, rice by-products, yeast, liver, cane molasses.	1600 micrograms	1600 micrograms
Vitamin B ₁₂	Not identified chemically.	Necessary for feather development. Prevents rough, shaggy, sparse brittle feathering.	Liver, yeast, milk by-products (only sources studied).	Undetermined	Undetermined
D(D ₃) ³	Chemically identified but not named.	Necessary for calcium and phosphorus utilization. Prevents rickets, laying of thin-shelled eggs, and failure in egg production and hatchability.	Fish oils, activated animal sterols (also synthesized in body by irradiation with ultra-violet light from sun light or special lamps).	180 A.O.A.C. units	450 A.O.A.C. units.
Vitamin E	Alpha-tocopherol	Preserves health of reproductive organs and of cerebellum and cerebrum of brain. Prevents nutritional encephalomalacia (crazy chick disease), failure in hatchability and loss of fertility in males.	Grains, wheat by-products, alfalfa meal, green pasture, wheat germ oil.	Undetermined	Undetermined
Vitamin G(G ₂)	Riboflavin	Necessary for growth. Preserves health of peripheral nerves. Prevents leg paralysis (curly toe disease) and failure in hatchability.	Milk products, yeast, liver, alfalfa meal, cereal grass, green pasture, by-products of fermenting and distilling industries.	1600 micrograms ⁴	1300 micrograms ⁴
Vitamin H	Biotin	Necessary for growth and hatchability. Prevents perosis and a dermatosis similar to pantothenic acid deficiency.	Grains, liver, yeast, cane molasses, alfalfa meal, green pasture.	45 micrograms	70 micrograms
Vitamin K	Chemically identified but not named.	Preserves clotting power of blood. Prevents death from hemorrhage.	Alfalfa meal, green pasture, meat scrap, fish meal.	Undetermined	Undetermined
None	Niacin (Nicotinic acid)	Necessary for growth and feather development. Prevents inflammation of mouth cavity, esophagus and crop and scaly dermatosis of skin and feet.	Liver, yeast, wheat by-products, rice by-products, peanut meal, corn distillers' solubles, corn gluten feed, cereal grass, barley.	8 milligrams	Undetermined

None	Pantothenic acid	Necessary for growth and hatchability. Preserves health of skin and spinal cord. Prevents scabby lesions on margins of eyelids, at corners of mandibles and around vent, thickening and fissuring of skin on bottoms of feet, and awkward gait.	Milk products, yeast, liver, cane molasses, peanut meal, corn distillers' solubles, alfalfa meal, green pasture.	5 milligrams	7 milligrams ⁵
None	Choline	Necessary for growth, bone development, and egg production. Prevents perosis.	Grains, wheat by-products, liver, meat scrap, fish meal, milk products, soy-bean meal, peanut meal.	700 milligrams	Undetermined
None	Inositol	Necessary for growth.	Grains, wheat by-products, alfalfa meal, milk products, yeast, liver.	Undetermined	Undetermined
None	Glucuronic acid ⁶	Necessary for growth.	Oats, wheat by-products, liver, meat scrap, fish meal.	Undetermined	Undetermined
None	Tentative name, "anti-gizzard erosion factor." Not identified chemically but cholic acid of bile is effective preventive.	Prevents "crater-like" lesions and eroded areas in secreted lining of gizzard.	Alfalfa meal, green grass, wheat by-products, oats, fresh milk.	Undetermined	Undetermined
None	Folic acid	Necessary for growth and hemoglobin formation.	Liver, yeast, leafy plants, wheat by-products.	Undetermined	Undetermined
None	Beta-pyracin	Necessary for conversion of third "L casei factor," a precursor of folic acid to folic acid, a substance required for growth and hemoglobin formation.	Liver, yeast (only sources studied).	Undetermined	Undetermined
Factor U, factor R, vitamin B ₁₂ and vitamin B ₁₁	Effects appear to be due to folic acid and (or) its precursors	Necessary for growth, maintenance of weight, hemoglobin formation, egg production and hatchability.	Milk products, yeast, liver, alfalfa meal, cereal grass, green pasture, corn distillers' solubles.	Undetermined	Undetermined
None	"Animal protein factor"	Necessary for growth and hatchability.	Liver, fish meal, fish stockwater, meat scrap, dried skim milk (other milk products not studied).	Undetermined	Undetermined

³Probably the most important of several antirachitic substances found in fish liver oils and irradiated animal sterols.

⁴Riboflavin content of growing and laying rations should not be less than 900 micrograms per pound.

⁵Pantothenic acid requirement of layers is less than that of breeders.

⁶One of a number of interchangeable substances producing the same biological effect.

¹From "Recommended Nutrient Allowances for Domestic Animals I. Recommended Nutrient Allowances for Poultry." A Report of the Committee on Animal Nutrition. National Research Council, Washington, D. C., June 1944.

²Vitamin A content of growing rations should be 1800 U.S.P. units per pound.

Vitamin E.—Vitamin E has been shown to be necessary in the ration to maintain healthy reproductive organs and prevent failure in fertility and hatchability. But since vitamin E is present in grains, wheat by-products, alfalfa meal and green grass, experiments at the University of Wisconsin, at California and other places indicate that where a good ration is fed, there are no benefits received from adding vitamin E concentrates in the form of wheat germ oil to the ration.

Proteins.—It is more or less generally understood that a ration in which the entire protein content is of vegetable origin will not give as good results as when the protein is partly or all from animal sources. Byerly and his associates (1937), and Christiansen, Halpin, and Hart (1940) showed that when the protein source was all soybean meal, winter hatchability was very low, and the latter showed this could be corrected by adding flavin carrying feeds such as yeast, dried whey, or skimmilk. Byerly and his associates also showed that the addition of beef scrap improved the hatchability of the all-soybean meal ration.

It has also been shown that different sources of animal protein will give varied results in hatchability, due partially at least to the fact that certain meat products contain more vitamins than others. For this reason, liver meal is used quite extensively in mashes for breeding flocks. It has also been shown that a mixture of liver meal and buttermilk will give better results than either one alone. It would, therefore, appear that a variety of proteins is more desirable than the use of any particular one.

Minerals.—Since the shell of the egg is largely calcium and serves as a source of minerals for the growing embryo, it is logical to expect that a deficiency of minerals will result in lowered hatchability. Experiments by Buchner, Martin, and Peter (1929) have shown that a ration too low in calcium will result in lowered hatchability. But other experiments have also shown that overloading the ration with calcium may also result in lowered hatchability. Extremes in mineral feeding, therefore, should be avoided.

Manganese is also essential for good hatches, as little as 50 parts in one million showing definite benefit.

Experiments at the University of Minnesota by Johnson (1935) and others showed no advantage in adding iodine to the diet.

Every effort should be made by hatcherymen to see that flock owners feed a balanced and complete ration. Incomplete rations may result in eggs hatching so poorly that it is unprofitable to hatch them. Atwood (1927) and many others have showed that heavy feeding prior to the hatching season does not adversely affect fertility or hatchability.

Artificial Lights.—It is a common idea that the use of artificial light injures the breeders for hatching purposes. Possibly this has, in the past, been due to improper feeding, because experimental evidence does not seem to support this opinion. Kennard and Chamberlin (1931) found that pullets not artificially lighted had an average hatchability of 62.69 per cent; pullets under 4 A.M. lights, 68.69 per cent; and pullets under all-night lights, 68.01 per cent. Results for hens were practically the same.

Still, a flock under lights should be watched very closely, particularly with respect to weight of the layers, for a molt very often follows a loss in weight.

Weather and Seasonal Variation.—It is common information that the best hatches are generally received during the natural breeding season in the spring. Vickers (1936), and Funk (1934) have shown that drops in hatchability follow severe cold spells. Whether this is due to drops in fertility or whether it is due to more embryos dying is not known, but in all probability is due to a combination of these factors.

Vickers (1936) has also shown (Table XXII) that early in the season the hatcheries in southern Ohio normally receive better hatches than those in northern Ohio. Apparently, this is accounted for by the fact that in southern Ohio there is more sunshine and less snow, and the birds get outdoors more in the sun and get more grass to eat. As the season progresses and the birds get out more in the northern part of the state, this difference gradually disappears. Funk (1934) also has pointed out that hatches generally drop during the hot summer months. Heywang (1944) observed that both fertility and hatchability were adversely affected by a high environmental temperature. Hatcherymen generally find that as the cooler fall weather comes on, the hatches improve.

Flock Management.—General flock management will have considerable influence on hatchability. Outbreaks of disease such as

roup, fowl pox, and others invariably result in much poorer fertility and hatchability, and every effort in sanitation should be made to prevent such outbreaks. In areas where the temperature variations are extreme, insulated houses will help to protect the breeding birds from frozen combs and wattles.

TABLE XXII.—HATCHABILITY BY WEEKS IN SOUTHERN AND NORTHWESTERN OHIO
(Vickers—1936)

Week Eggs Hatched	Week Eggs Were Produced	Number of Hatcheries reported		Average Hatchability		Difference between South and N.W. Ohio and which was better	
		South	N.W.	South	N.W.		
Jan. 6	Dec. 9	4	3	59.2	60.7	.5	N. West
Jan. 13	Dec. 16	3	3	67.7	62.3	5.4	South
Jan. 20	Dec. 23	3	3	66.0	56.7	9.3	South
Jan. 27	Dec. 30	7	3	66.6	55.7	10.9	South
Feb. 3	Jan. 7	11	5	65.5	59.0	6.5	South
Feb. 10	Jan. 14	15	5	68.0	57.4	10.6	South
Feb. 17	Jan. 21	15	5	66.3	60.4	5.9	South
Feb. 24	Jan. 28	14	10	64.7	54.3	10.4	South
Mar. 3	Feb. 3	16	13	63.8	57.0	6.8	South
Mar. 10	Feb. 10	17	13	67.0	59.3	7.7	South
Mar. 17	Feb. 17	17	13	68.0	61.0	7.0	South
Mar. 24	Feb. 24	19	13	67.6	60.7	6.9	South
Mar. 31	Mar. 3	19	13	70.0	63.5	6.5	South
Apr. 7	Mar. 10	19	13	71.9	65.0	6.9	South
Apr. 14	Mar. 17	19	13	71.6	66.5	5.1	South
Apr. 21	Mar. 24	19	13	72.8	68.3	4.5	South
Apr. 28	Mar. 31	19	13	72.8	68.8	4.0	South
May 5	Apr. 7	13	13	72.0	69.0	3.0	South
May 12	Apr. 14	16	13	71.6	69.3	2.3	South
May 19	Apr. 21	18	12	71.6	69.6	2.0	South
May 26	Apr. 28	17	12	72.2	69.8	2.4	South
June 2	May 5	15	10	70.7	68.5	2.2	South
June 10	May 12	9	7	73.0	69.0	4.0	South
June 17	May 19	4	5	68.0	66.8	1.2	South
June 24	May 26	2	3	70.5	67.7	2.8	South
Average by weeks				68.8	63.4	5.4	

Dubbing of Combs and Wattles.—Freezing temperatures will cause a drop in both fertility and hatchability if the combs and wattles are frozen. Payne and Ingram (1927), as well as Searcy and Andrews (1943), have shown that freezing of the combs and wattles results in reduced hatchability for 11 to 18 days after the injury occurs. Male birds that have their wattles frozen may be sick and

worthless for a much longer period, and often infection sets in and causes death.

To prevent frost injury, many breeders and hatcherymen dub their breeding males, particularly Leghorns, as a regular practice. Many of them maintain that dubbing seems to result in much greater vigor and vitality. Moreover, there is less danger of injury in dubbed males from fighting.

Dubbing of the combs can be done at any time from day old age up to maturity. A few even dub the combs at hatching time with small scissors, but it is more desirable to wait until later when the combs can be examined for disqualifications and defects so that such birds can be disposed of. The wattles, which often cause most of the trouble after freezing, cannot be dubbed until the birds reach about broiler size. Some even dub the wattles and leave the combs, preferring to see males with combs. Dubbing at broiler age is probably the most satisfactory time. It is less severe on the birds and by this time any defects can be seen.

Dubbing should be done with rather dull instruments, so that the blood vessels are pinched together in the cutting process. This helps to reduce bleeding. Tin snips are quite often used. With the proper instruments and with care in not cutting the wattles too short very few losses will be experienced, much less than is often experienced with infected wattles. Doing the job on a warm day reduces the danger of excessive bleeding. A cold day should be avoided.

On many farms wattle infection occurs almost every year, even when there is no freezing. This infection is said to be due to the cholera and colds organisms although relatively little is known about it. On some farms, a large percentage of both males and females get it. Dubbing of the wattles on males is almost a necessity on such farms to avoid loss of fertility and high death loss in males.

INSTRUCTIONS TO FLOCK OWNERS

For the hatcherymen to have the knowledge of how to produce good eggs is one thing, but to see that the flock owners get this information and put it into practice is another. It requires continued education and supervision.

Instructions regarding the selection of eggs, their care at home,

packing for delivery or shipment and similar points are usually printed or mimeographed on the slips which the flock owner fills out each week with his name, breed, number of eggs, etc., to put in each case of eggs delivered or shipped to the hatchery.

For care of the flock and general instructions, mimeographed letters are in most general use and usually are sent out several times during the season. Cards are also used to tack up in the poultry houses. The following card was prepared by the Ohio Approved Hatcheries to be placed in the houses of all flock owners supplying eggs.

THE OHIO APPROVED HATCHERIES

REQUESTS

YOUR COOPERATION IN PRODUCING BETTER

OHIO APPROVED CHICKS

YOU CAN

1. Improve and maintain the health of your flock.
2. Improve the hatching quality of your eggs.
3. Improve the quality of chicks from your hatching eggs.
4. Improve your egg production and egg quality.
5. INCREASE YOUR PROFITS.

BY DOING THE FOLLOWING THINGS

1. Remove immediately when noticed any diseased or unthrifty birds.
2. Keep the houses clean and sanitary. This helps prevent disease.
3. Feed a balanced and complete ration at all times.
4. Feed green feed in some form at all times such as:
 - a. Alfalfa leaf meal, or alfalfa, clover, soybean hay.
 - b. Fresh cut alfalfa, clover, soybeans or cabbage, carrots, yellow beets, etc.
 - c. Good range of alfalfa, clover or bluegrass. In winter bluegrass, rye, or wheat range.
5. Include milk in the ration in some form.
6. Allow the birds to get in the direct rays of the sun regularly by doing one or all of the following:
 - a. Allowing them on range whenever the weather is fit.
 - b. Providing a sun porch or sun yard.
 - c. Keeping the house fronts open when the sun shines.
7. If the birds do not get in the direct sun regularly, feed a good grade of vitamin D oil. (1 pint to 1 quart to each 100 pounds of feed.)
8. Keep the houses sufficiently warm in the winter to:
 - a. Prevent combs from freezing during cold spells.
 - b. Prevent the drinking water or milk from freezing.
9. Keep the eggs clean. Clean eggs are better for hatching and bring more on the market.

X

INCUBATION PRACTICES

KNOWLEDGE CONCERNING the science of incubation is of fairly recent origin. The art of incubation, however, was practiced by the early Chinese and Egyptians who passed this skill down from generation to generation, but not in a form that it was generally available to others. Modern incubators with thousands of eggs in a very limited space made exact information necessary for satisfactory results. These demands, as is usually the case, resulted in the development of the science of incubation to replace the art of incubation.

Receiving Eggs.—As a rule, eggs are delivered to the hatchery by the flock owners. Some large hatcheries, however, run truck routes, picking up the eggs from flock owners, while others maintain buying stations in surrounding towns to which the eggs are delivered and thence trucked or shipped by express to the hatcheries.

Generally, eggs are delivered to the hatchery on Saturday because most farmers come to town on that day for their regular shopping. In the larger hatcheries where settings are made every day, eggs may be delivered on several different days. Since most hatcheries set twice a week, part of the eggs are trayed immediately after being received and set on either Sunday or Monday, while the remainder are trayed later for the Wednesday or Thursday sets. The exact time of setting varies, being determined by the time the chicks must be taken off, sorted, and prepared for shipment to meet certain train schedules.

Number of Hatches Each Week.—Where the incubators permit, one hatch a week is the rule in the case of small hatcheries and breeders, and this is usually Monday. Most incubators, however, are so constructed as to require two hatches each week if run to capacity, these two days most often being Monday and Thursday. Large hatcheries may have hatches coming off every day in the week to distribute the labor more evenly.

Ordinarily, extra help, often women, is used on Saturday and sometimes on Wednesday, where twice-a-week egg deliveries exist, for traying eggs, cleaning machines on hatching days, and getting the eggs into the machines on schedule.

Quite often, setting of the eggs is done at night in order to provide work for the night man. He also cleans up the machines after the hatches are taken off.

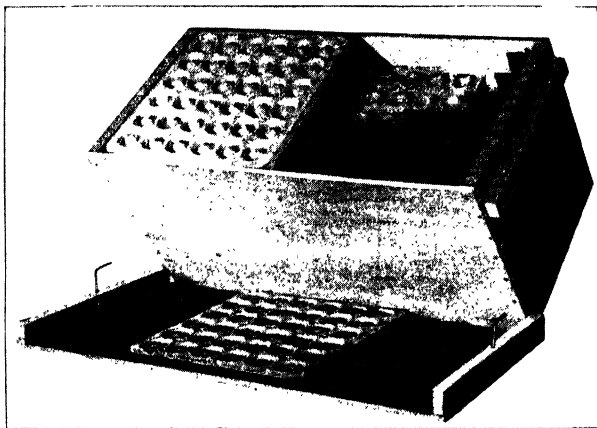


Fig. 63.—Most hatcheries use ordinary egg cases for hatching eggs, but some prefer special cases of stronger construction so that they will stand up under constant re-use.

Selection of Hatching Eggs.—The kind of eggs set will determine, in part, the quality of chicks hatched and the kind of eggs produced by the pullets when mature.

Flock owners should be provided with specifications of the kind of eggs expected from them. Those eggs not meeting these specifications should be rejected for hatching purposes either by being returned to the flock owners or by being sold for market eggs and the flock owners paid accordingly. Egg scales are often supplied to all flock owners. Sometimes pieces of cardboard or metal with certain sized holes are used and any eggs passing through these holes are considered too small. This method, however, is obviously not as

satisfactory as egg scales because of the variation in diameter of eggs of equal weight.

Egg Size.—The minimum egg weight should be 23 ounces per dozen, but 24 ounces is preferable. The size of the eggs set will determine the size of the chicks hatched to a large degree, as has been determined by several investigators.



Fig. 64.—Hatching eggs should be carefully sorted for size, shape and color. The quality of eggs set determines the quality of eggs the offspring will produce.
(*Ohio Poultry Improvement Association.*)

The fact that hen eggs are larger than pullet eggs and, consequently, produce larger chicks is one reason why hen chicks are preferred over pullet chicks. Furthermore, the continued use of small eggs will mean the establishment of flocks that produce mostly small eggs, since this factor has been proved to be inherited. Selection of large eggs will eventually mean large egg flocks. Particular attention should be paid to those eggs from which the flock owners are to receive chicks.

Accurate egg scales should be used by each person traying eggs, and any doubtful eggs should be weighed. Abnormally large, or small, eggs will likely be infertile, so they should not be set.

Many hatcheries use automatic graders for sorting and grading hatching eggs. This, of course, results in a more accurate job of grading and there is less apt to be complaints from flock owners who feel they are being discriminated against when the sorting is done by hand. The most desirable egg weights are between 24 and 28 ounces per dozen and the automatic graders can be set to sort the eggs according to these weights. Also, special sortings and selections of eggs producing flock owner chicks can be made accurately.

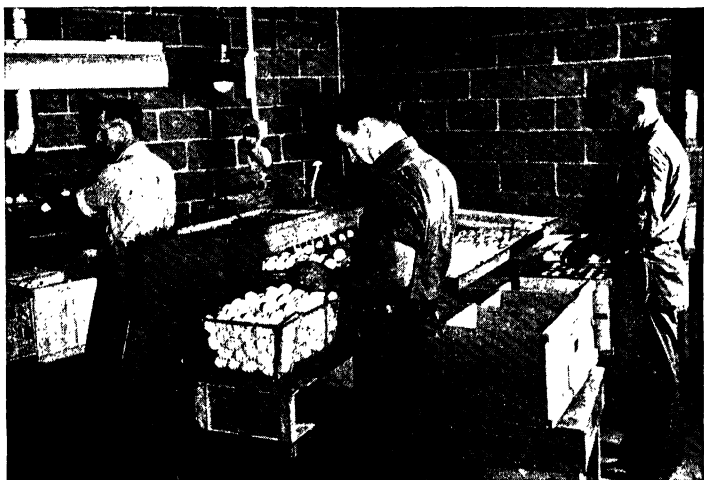


Fig. 65.—Many hatcheries and breeders use automatic graders to grade their hatching eggs according to size. (George M. Anthony.)

Egg Shell Color.—Egg color has also been shown to be inherited, which means that egg color can be controlled by the color of eggs set. With white eggs, the tints should be discarded. With brown eggs, the shades vary so much that usually only the very light and very dark ones can be discarded. Most markets prefer the medium and darker shades of brown. Wyandotte and Plymouth Rock eggs usually run lighter than Rhode Island Red and New Hampshire eggs. Many hatcherymen have succeeded in getting more uniform brown eggs by careful selection of those used for chicks going to flock owners.

Shell Texture.—It is generally accepted that eggs of poor shell texture will not hatch as well as those normal in texture and, consequently, should be sold as market eggs at traying time.

Care should be exercised in deciding what is poor shell texture. Badly ridged eggs, very glassy and brittle shells, and eggs with other obvious defects should be rejected. Funk (1934), however, has shown that eggs which appear mottled when candled and which are generally considered as having poor shell texture, hatch just as well as the so-called normal eggs.

At one time, failure of chicks to get out of the shell was thought due to its thickness, hence, oyster shell was withheld and other means attempted to produce thinner shells. Experimental evidence shows, however, that when the rations are low in vitamin D, or when the birds are not in the sunshine, the shells get thin, and the eggs hatch very poorly. If eggs are to hatch normally, the breeding hens must be able to digest the minerals and put them in the eggs.

Weak shelled eggs that do hatch will produce weak-boned chicks that live very poorly. Hatcherymen have noticed that when the breakage in eggs is heavy, the hatches are apt to be poor. Good hatching eggs should have strong, sound shells.

It is definite that shell texture is an inherited factor, and for this reason, weak shelled and poor shell texture eggs should be discarded. Flocks with a large percentage of weak and poor shelled eggs should be investigated with regard to the ration and dropped until such time as the egg shells become normal. If the trouble is due to inherited weaknesses, the flock should be replaced from stock producing good eggs.

Cracked Eggs and Cleanliness.—Close watch should be kept to remove all cracked eggs. They usually break in the egg trays. They can be identified simply by tapping two eggs together, the cracked one giving a distinctly flatter sound. These cracks can be sold on the market, while if set they will be a total loss as well as the cause of trouble in the incubator. It is doubtful if it is economical to candle all eggs to find the cracks and poor shells.

Extremely dirty eggs should not be set. The dirt may contain disease germs, resulting in incubator infection. If customers are allowed to open and look in the incubator, these dirty eggs make a poor advertisement too.

Dirt spots on eggs can be removed, however, with a moist cloth without injuring hatchability. Funk (1938) found that eggs could be washed in a solution of one-half of 1 per cent of concentrated lye in water without injuring hatchability. Rubber gloves must be worn in this process to protect the hands.

Holding Eggs.—By the time the eggs reach the hatchery, they may be from one to seven days old. They are often held in the hatchery a few days. The conditions under which eggs are held are known definitely to affect the hatching quality. It is important, therefore, that they be held in the proper environment both by the flock owners and by the hatcheries.

Age.—Funk (1934) found that eggs held at temperatures between 45° and 60° F. for 14 days were not injured, but after 14 days, they deteriorated very rapidly. Scott (1933) found that eggs held at approximately 54° F. with a wet bulb reading of about 52.5° F. held up very well for 21 days, but deteriorated rather rapidly after this time.

Hall and Romanoff (1943) observed that eggs held in air longer than two weeks at 50° and 60° F. showed a marked decline in hatchability with age.

In another series of experiments, however, at Kansas by Warren (1934), it was found in some cases that certain eggs began to deteriorate after six days and that eggs varied considerably as to the age at which they began to deteriorate, even when held under the same conditions. Apparently, early embryonic mortality is increased with the length of time eggs are held. Also the longer eggs are held, the greater the length of time required for incubation.

Considering the conditions under which most eggs are held, decreased hatchability can be expected for most eggs held after one week. Hatcheries should try to hold eggs no longer than this before setting.

Turning.—It has always been thought necessary to turn eggs at least once daily while being held, but there seems to be little evidence to show the need for turning if held only one week. Funk (1934) found that turning for the first week did not influence the hatchability. Waite (1919) found that turning even up to three weeks did not influence hatchability. As a matter of safety, however, it may be desirable to turn eggs if held over one week.

TABLE XXIII.—EFFECT OF AGE AND TURNING ON HATCHING EGGS
(After Waite, 1919)

Age in Days	% Hatched Turned (All Eggs)	% Hatched Not Turned (All Eggs)	% Hatched Turned (Fertile Eggs)	% Hatched Not Turned (Fertile Eggs)
1-10	44.5	39.5	55.1	48.6
11-20	34.3	35.0	41.7	41.6
21-28	13.6	18.1	17.9	24.5

Temperature.—The most desirable temperatures for holding eggs range between 45° F. and 65° F. Scott (1933) states that holding eggs for prolonged periods at either high (above 60°) or low (below 36°) results in the death of many embryos during the first few days of incubation. He found that Leghorn eggs held at 36° F. were not affected until after the sixth day, but deteriorated very rapidly after this.

Dougherty (1926) found no bad effects in holding at a temperature from 28° to 32° F. for one to three successive nightly periods of 14 hours each, but he did get a reduction in hatchability after exposing the eggs for four nights plus a continuous chilling for 38 hours.

Humidity.—After careful experiments, Cooney (1943) concludes:

The presence of a comparatively high relative humidity during the holding periods of hatching eggs definitely increased the hatchability whether measured by per cent hatch of apparently fertile eggs or by total eggs incubated.

It is important, therefore, that hatching eggs be held in a room with a relatively high humidity before being placed in the incubator.

Holding Turkey Eggs.—Turkey eggs apparently can be held longer than chicken eggs without deteriorating. Scott (1933) found that eggs kept remarkably well up to 34 days at temperatures of about 54° F., but when kept at 36° F. deteriorated very rapidly in hatchability after six days. As far as is known, the optimum conditions for holding turkey eggs are the same as for chickens.

Most people with small flocks of turkeys, however, hold the eggs too long at temperatures that are generally too high. The result is that many turkey eggs are severely injured prior to the time they get to the hatcheries, consequently, causing poor hatches.

Incubation Periods.—The length of the incubation period varies for different species of birds, the larger ones ordinarily requiring

longer time. These periods also vary slightly according to the individuality of birds and flocks, temperature and humidity of the incubator, etc., but the average length of time for each species is given here:

Hen	21 days	Guinea	26-28 days
Duck	28 days	Pheasant	22-24 days
Duck (Muscovy)	35-37 days	Peafowl	28 days
Goose	30-34 days	Ostrich	42 days
Turkey	28 days	Pigeon	16-20 days

Incubator Room Conditions.—Room conditions in which the incubators are located, will exert considerable influence upon the ease and accuracy with which the incubators can be operated. If these room conditions are not approximately correct, or if they change suddenly and often, more trouble will be had with such problems as temperature, ventilation, and moisture control in the incubators.

Room Temperature.—The most satisfactory room temperature is between 70 and 75° F., and it is important that it be uniform.

It is very important that the eggs are not chilled the first few days of incubation, and since the doors must be opened for various lengths of time, a warm room is desirable. When chicks are taken out of the incubator, the room should also be warm to prevent chilling. To keep uniform temperatures requires a well insulated building as a protection against rapid outside changes and some means of ventilation for control when the temperature gets too high.

Room Ventilation.—Ventilation is needed to bring fresh air in the room and take out the used, or foul air. This can be accomplished by means of windows, properly arranged according to the type of incubator used, or with special ventilators. Ventilation is also needed as a means of temperature control, more being needed in warm weather and less in cold weather. The incubator companies usually outline the best arrangements for their machines.

Room Moisture.—Relatively high room moisture is desirable as a sanitation measure, because the more moisture present, the less dust and down there will be flying to carry disease germs into the incubators, or to the chicks in boxes or brooders. Where automatic moisture arrangements are not provided with the incubators, moisture must be provided from the air in the incubator room, and, as will be

shown later, a high moisture condition is necessary for best hatching results.

Setting the Incubator.—Experiments have shown that the position of the egg during the first 18 days is of little consequence, except that eggs should never be trayed with the little ends up. Few eggs so trayed will hatch. With sectional machines, eggs are laid on their sides, but with cabinet machines, they are usually set on end and then laid on the side when transferred to the hatching trays. When



Fig. 66.—Traying of the eggs can be speeded up with equipment designed for that purpose. (Guy A. Leader.)

set on end, it takes a little more time and labor to tray, but requires less space. When set on end, the large end should always be up. As a rule, eggs are trayed as brought in by the flock owners and the trays placed in racks and held in these until ready to set.

BARRED ROCKS		
Date Set	No. Infertile	No. Hatched
Flock Name		No. Set

Fig. 67.—An incubator tray card. Each breed has a different colored card so that there can be no confusion when taking off hatches.

As the eggs are trayed, the trays should be marked with proper cards giving the name of the flock owner, date set, breed, grade, and number of eggs. Space on these cards should also be provided for the number of infertiles and dead germs, the number of good chicks hatched, the number of dead in shell, and any other information desired. After the hatch is over, these cards can be taken to the office and accurate records kept on every flock.

Since it has been shown that incubator temperature variations may cause some embryo mortality, it is desirable to allow the eggs to set in the hatchery room or some other room for some time in order to get the chill off before they are set. Then they should be set as rapidly as possible in order to prevent the incubator temperature from dropping any appreciable extent.

EMBRYO DEVELOPMENT

Every hatcheryman should have a fairly good idea of the development of the chick or embryo in the egg at different stages of the

incubation period. It is of value to know at approximately what age embryos are dying if trouble is experienced.

Before Incubation.—Before the egg is laid, a very small development has taken place in the germinal disc, but after being laid, this development ceases until proper temperature is again provided. Development starts again at about 70° F., hence, the importance of keeping eggs below this point when being held for incubation, for constant changing from low to high temperatures likely injures these delicate structures.

TABLE XXIV.—EVENTS IN EMBRYONIC DEVELOPMENT
(Romanoff, 1931)

Before egg-laying:	Fertilization Division and growth of living cells Segregation of cells into groups of special function (tissues)
Between laying and incubation:	No growth; stage of inactive embryonic life
During incubation:	
First day:	
16 hours	First sign of resemblance to a chick embryo
18 hours	Appearance of alimentary tract
20 hours	Appearance of vertebral column
21 hours	Beginning of formation of nervous system
22 hours	Beginning of formation of head
24 hours	Beginning of formation of eye
Second day:	
25 hours	Beginning of formation of heart
35 hours	Beginning of formation of ear
42 hours	Heart begins to beat
Third day:	
60 hours	Beginning of formation of nose
62 hours	Beginning of formation of legs
64 hours	Beginning of formation of wings
Fourth day	Beginning of formation of tongue
Fifth day	Formation of reproductive organs and differentiation of sex
Sixth day	Beginning of formation of beak
Eighth day	Beginning of formation of feathers
Tenth day	Beginning of hardening of beak
Thirteenth day	Appearance of scales and claws
Fourteenth day	Embryo gets position suitable for breaking the shell
Sixteenth day	Scales, claws, and beak becoming firm and horny
Seventeenth day ...	Beak turns toward air cell
Nineteenth day	Yolk sac begins to enter body cavity
Twentieth day	Yolk sac completely drawn into body cavity
	Embryo occupies practically all the space within the egg except the air cell
Twenty-first day	Hatching of chick

During Incubation.—With proper incubation conditions, development in the blastoderm, as the germinal disc is now called, proceeds again very rapidly, the first development being called the primitive streak and occurring in the first 12 hours. At about 24 hours, a membrane called the amnion gradually develops and surrounds the growing embryo. At about 30 hours, the heart has developed enough to begin to beat.

At about 36 hours, a blind sack called the allantois begins to develop from the posterior end of the alimentary tract and grows until it completely covers the embryo by the ninth day. By this time, it has come in contact with the shell membrane and serves as the means of respiration and excretion by which oxygen is taken in and carbon dioxide given off. The veins of this sack can be seen at testing on the seventh day. At hatching time, this sack degenerates and is left in the shell.

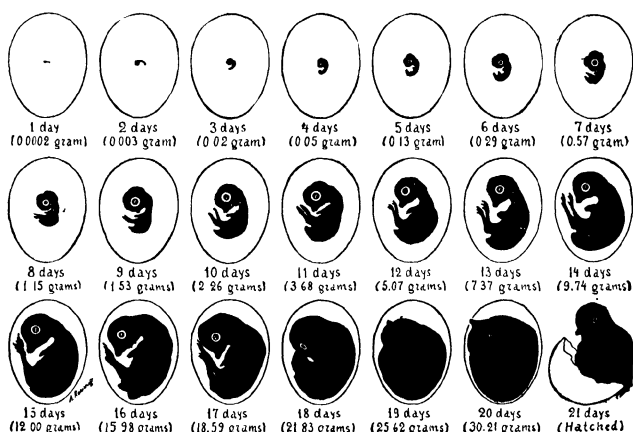


Fig. 68.—Daily changes in the weight and the form of the developing embryo of a White Leghorn chick. (*Cornell Extension Bulletin 205.*)

At the sixth and seventh days, the legs and wings begin to take a form that can be recognized. The body begins to develop rapidly. At about 10 days, little sacks containing the feathers begin to show along the back and the horny beak begins to form. By the thirteenth day, the feathers are over the body, although still in the thin walled

sacks, and the scales and nails appear and by the sixteenth day are quite firm. By the sixteenth day, the white of the egg has been utilized in the formation of the chick, and on the nineteenth and twentieth days, the yolk is drawn in the body.

When the chick is properly formed, the head is at the large end of the egg and is bent underneath the right wing with the legs drawn up toward the head. The tip of the upper beak has a horny cap with a real sharp point. It is with this sharp instrument that the chick cuts or breaks a path around and through the shell and membranes, while slowly revolving or turning within the shell. Sufficient force to break the shell is obtained by the chick being able to press against the shell. When the shell is about chipped or cut all the way round, a final struggle breaks the large end of the shell away, and the chick kicks out of the remainder of the shell, leaving the membranes.

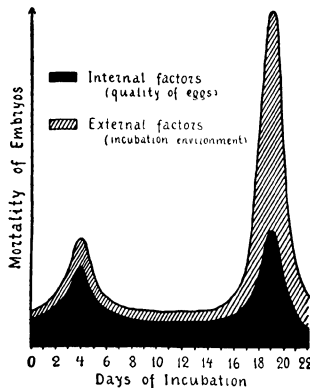


Fig. 69.—Influence of internal and external factors on embryonic mortality in different stages of artificial incubation. (*Cornell Extension Bulletin* 205.)

Embryo Mortality.—Why don't the eggs hatch better? Why do they die in the shells just before hatching time? These are questions hatcherymen continually wonder about.

It has been shown that there are two periods during which most embryos die, the first of these periods being at about the fourth or

fifth day, and the second during the eighteenth and nineteenth days, the larger number invariably dying during the latter period, as hatcherymen can testify.

Malformations, or malpositions, cause a large number of these dead-in-shell chicks. The normal position of the chick is with the head towards the large end of the egg bent underneath the right wing. Hutt (1928-29) observed that the majority of chicks or embryos dying after the eighteenth day are found in one of the following malpositions:

1. Head extended downward between the thighs.
2. Head at the small end of the egg.
3. Head at the large end of the egg, but turned to the left instead of to the right, so that the beak is near the shell opposite the air cell.
4. Head towards the right and under the right wing as in normal position, but rotated in the shell, so that it is buried opposite the air cell.

Some of the causes of embryo mortalities, abnormalities, and malpositions have been found to be as follows:

1. Heredity—the tendency has been noted for certain individuals to produce more of these than others. When so observed, these particular individuals should be discarded. This, of course, can be done only when trapnesting and pedigreeing are carried on.

2. As mentioned previously, holding eggs too long usually results in increased early embryo mortality and, apparently, the same thing results when eggs held for short periods are held at temperatures too high or too low.

3. There is some evidence to suspect that rations too high in vegetable proteins and not properly supplemented with minerals and vitamins may result in increased malpositions and abnormalities.

4. Some experiments indicate that these malpositions and abnormalities may increase as the season progresses, but the reasons are unknown.

5. Byerly (1938) has shown that incubator temperatures either above or below the optimum will result in increased embryo mortality and malpositions. Taylor, Gunns, and Moses (1933) found that current interruptions of 12 hours resulted in lower hatches, increased the number of crippled and weak chicks, and increased the number of embryo mortalities.

6. Incomplete and inadequate rations will result in increased abnormalities and malpositions in the embryos.

OPERATION OF THE INCUBATOR

Specific directions applicable for the operation of incubators of all makes and all types are obviously impossible. Different types require different conditions. For instance, there is a difference in temperature between the sectional and cabinet machines. All that can be done here is to give some fundamentals that apply to all machines and all types.

Follow Manufacturer's Directions.—Specific directions for each make of incubator are furnished when they are purchased. For the most part, these directions furnished by the incubator companies are reliable, having been worked out as the result of years of careful research and observation of their machines in use by hatcheries. This is particularly true of those companies which maintain good research and service departments. The directions should be carefully studied and followed.

However, every incubator has more or less of a "personality." In other words, no two machines run exactly alike and, hence, require certain little adjustments to meet these little differences. They will be discovered only by actual operation, and they can then be handled in the proper manner. Oftentimes, it takes considerable time and experiment to find out the proper things to do. Hatcherymen should not hesitate to call on the incubator companies for help to solve these problems.

Temperature.—Temperature was naturally the first incubator factor to receive attention, because only within certain limits will the embryo live and develop. Early records showed that the top and bottom temperatures of eggs set under hens vary a great deal, the top temperature running from about 100° F. during the first day to as high as 104° F. during and just before hatching, with the bottom running from about 85° F. early to about 95° F. on the twenty-first day.

From these results and from a large amount of experimental data with small, individual machines and with sectional machines, the desirable temperatures for sectional machines have been found to be

about $101\frac{1}{2}^{\circ}$ to 102° F. the first week, 102° to 103° F. the second week, 103° F. the third week, and $103\frac{1}{2}^{\circ}$ to 104° F. at hatching time. These figures apply when the thermometer is even with the top of the eggs. When the room temperature is high, these figures may be lowered slightly, and when cold, should be raised slightly.

With cabinet machines, however, the top and bottom egg temperatures are the same, and, hence, lower machine temperatures are used. The recommended figures vary from 99° to 100° F. according to the machine used. Just why one type of cabinet machine should give better results at 99° F. and another at 100° F. is often confusing.

Temperature requirements will vary slightly according to the humidity of the air; the higher the humidity, the lower the temperature needed. Townsley (1930) as a result of a series of experiments with forced draft machines states as follows:

Reducing the operating temperature without changing the wet bulb reading in the high humidity machine made a marked improvement in the per cent of hatch, in the size of the chicks, and in their livability, and eliminated the stickiness noted at the higher temperature. These results indicate . . . the per cent of relative humidity also has a very important influence on the temperature requirements . . . It appears that as humidity is increased, the operating temperature must be decreased, and when the humidity is low, the temperature must be run higher . . . The above hypothesis . . . affords a most logical explanation of the contradictory views held by hatcherymen on the question of proper humidity.

Byerly (1938) reported in one type of forced-draft incubator that with temperatures the first 18 days of 97° F., $99\frac{3}{4}^{\circ}$ F., and $102\frac{1}{2}^{\circ}$ F., and with a uniform temperature of 97° F. in the separate hatcher for all groups, hatches of fertile eggs for the three groups were 49.4, 85.3 and 24.3 per cent, respectively.

Barott (1937), in a series of tests with incubation temperatures of 96° , 98° , 99° , 100° , 102° , and 103.5° F. with a constant relative humidity of 60 per cent, found that the best hatches were obtained at 100° F. The hatch decreased at higher and lower temperatures, slowly at first, then more rapidly as the deviation from 100° increased, until at 96° and 103.5° all the embryos died in the shell.

Romanoff (1939) found that embryo development was affected more by temperature variations in the early stages of incubation than in the later stages, being accelerated by higher and suppressed by lower temperatures than normal, but that after exposure to these variations, embryo development was suppressed during the re-

mainder of incubation, resulting in delays in time of hatching. The mortality in embryos indicated that the greater damage was done by high temperatures during the early periods of incubation and low temperatures during the later periods.

In cabinet machines, high prolonged temperatures cause heavy embryo mortality. Low temperatures, of course, cause a slowing up of growth or development and result in late hatches, but embryos can survive much longer periods of low temperatures than high temperatures. This is of importance when the current goes off in cabinet machines. More care must be taken to prevent overheating.

Where separate hatchers are used, the practice is to reduce the temperature and increase the humidity after the eggs are transferred to the separate hatchers. Some experimental results tend to support this practice and Romanoff (1936), as a result of his experiments at Cornell University, recommends that the separate hatcher temperature be lowered from 1° to 2° F. for chicken eggs.

Temperature for Turkey Eggs.—In the incubation of turkey eggs, very similar temperatures to those used for chicken eggs apparently give good results. Martin and Insko (1935), and others as well, recommend for sectional incubators temperatures of 100½°, 101½°, 102½°, and 103° F. the first, second, third, and fourth weeks, respectively, with the thermometer even with the top of the eggs. In forced-draft incubators, they recommend a temperature of 99½° F. with a relative humidity of 60 per cent (wet bulb 88° F.) until the eggs start to pip, when the humidity should be increased to 70 per cent (wet bulb 90° to 91° F.). They suggest that turkeys may need slightly higher humidity at hatching time than chickens. It has been reported that if the temperature is run too high with turkey eggs there is apt to be considerable trouble with so called "spraddle legged" poults.

Humidity.—During incubation the egg loses weight, part of which is moisture. If too much water is lost during incubation, the eggs either fail to hatch, or they hatch poorly and produce inferior chicks. The amount of water evaporated from the egg will be determined to a large extent by the amount of moisture in the air of the incubator.

Table XXV shows the effect of the relative humidity on the weight loss of the eggs and on the hatchability, indicating that for

still air machines, with which these results were obtained, the relative humidity should be between 30 and 60 per cent and the egg weight loss about 10 per cent if the best results are to be obtained. Other results are similar to these so there can be little question as to their correctness for sectional machines. As will be noted, there is quite a variation where equally good results will be obtained.

TABLE XXV.—EFFECT OF RELATIVE HUMIDITY ON LOSS IN WEIGHT OF EGGS
AND ON HATCHABILITY

(Lamson and Kirkpatrick, 1918)

Per cent Relative Humidity	Average Loss in Weight per Egg in Grams	Per cent Loss of Weight	Per cent Hatch of Fertile Eggs
70-80	3.03	5.3	45.5
60-70	4.96	8.7	62.1
50-60	5.61	9.8	69.3
40-50	5.82	10.2	68.6
30-40	6.57	11.5	68.6
20-30	8.29	14.5	60.6
15-20	9.94	17.4	48.0

A weight loss in eggs of about 10 per cent seems to give the best results. This was found to be true in experiments with small incubators as shown in Table XXV, and in experiments with forced draft

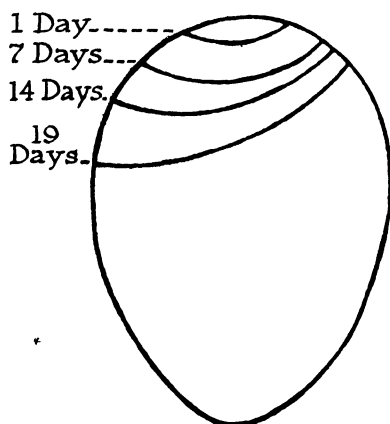


Fig. 70.—Normal size of the air cell at various stages during incubation. (*Maine Ext. Bul.* 167.)

machines as reported in unpublished data supplied by the research departments of several incubator companies.

It might be added here that to obtain the per cent relative humidity, wet and dry bulb thermometers must be used. Air must pass rapidly over the wet bulb or else the thermometer must be whirled rapidly. Then the wet and dry bulb readings are made, and from these two readings, the per cent relative humidity is obtained from psychrometric or relative humidity tables. The wet bulb reading is not the relative humidity. This should be clearly understood, because quite often experimental results are given as wet bulb readings rather than as per cent relative humidity, and they should not be confused.

The following table showing the wet-bulb reading and the equivalent relative humidity was supplied by Vondell (1945) in Massachusetts State College Leaflet 237:

Wet-bulb Reading	Thermometer Reading ° F.			
	98°	99°	100°	101°
Relative Humidity				
90	73	70	68	65
89	70	67	65	63
88	67	65	63	60
87	65	62	60	57
86	61	59	57	54
85	58	56	54	51
84	55	53	51	49
83	53	51	48	46
82	50	48	46	44
81	48	45	43	41
80	45	43	41	39

Do the experimental results with still air machines apply to agitated air or fan and paddle machines? Very likely not in view of the fact that the rapidity with which the air moves undoubtedly affects the rate of water evaporation from the eggs. Very little evidence, however, is available on this point. In the results in Table XXV, for example, a relative humidity of 30 to 40 per cent gave as good hatches as higher figures, but in results secured by Townsley (1930), the hatches averaged 8.9 per cent less with 32.5 per cent humidity than with 56 per cent.

Do the results with fan machines apply to paddle machines where the air circulates less rapidly? We do not know and have been unable to secure evidence on this point, but it would seem logical, at least, that the less rapidly the air moves through the incubator, the less moisture needed; and the more rapidly it moves, the more needed, if equal evaporation and egg weight losses are to be obtained. This means that the safe procedure to follow is to accept the data given here as applying only to the type of machines in which they were secured. In practice, it means that each make of incubator should provide definite data showing what is the correct air moisture condition for best results.

Townsley (1930) in experiments with forced draft machines found that relatively high humidity increased hatches, produced cleaner hatches with fewer sticky chicks, produced larger chicks, and improved the livability. He also concluded that there is little danger of getting the humidity too high, providing the temperature is corrected to balance the high humidity.

TABLE XXVI.—RESULTS FROM DIFFERENT DEGREES OF HUMIDITY IN INCUBATION
(SMITH INCUBATORS)¹
(Townsley, 1930)

	Wet Bulb 75 Degrees Dry Bulb 100 (30% Rel. Humid.)	Wet Bulb 85 Degrees Dry Bulb 99 (56% Rel. Humid.)	Wet Bulb 90 Degrees Dry Bulb 98 (73% Rel. Humid.)
Number of Eggs Set	2974	2974	2974
Per cent Weight Loss or Evaporation..	15.8	9.9	7.4
Per cent Fertile Eggs Hatched	55.7	64.6	60.3
Average Weight per 100 Chicks	7.20	7.93	7.88
Per cent Livability to 3 Weeks	55.5	71.7	67.2

¹ This table is published merely to illustrate the effect of different degrees of humidity. The wet and dry bulb readings apply only to the particular type of machine used in these trials.

It will be noticed, however, in Table XXVI that the excessively high humidity of 90° wet bulb, or 73 per cent relative humidity, gave slightly poorer results in all points than the medium humid machine with 85° wet bulb, or 56 per cent relative humidity. These results correspond to those with still air or sectional machines, which showed that it is possible to get too much moisture, although this

condition rarely occurs. It is possible, however, that the proper temperature correction was not made for the high humidity groups, and that with the proper correction, the excessively high humidity may be just as satisfactory.

Barott (1937) found that with a temperature of 100° F. better hatches were received at a relative humidity of 61 per cent than at 30, 44, or 85 per cent. With an incubating temperature of 102° F.; the best results were obtained with a relative humidity of 58 per cent supporting the contention that with high humidity, the dry bulb temperature should be lower, and with low humidity, higher.

Romanoff (1930) states that extremes in humidity result in greater embryo mortality during the later period of incubation, that is around the 19th and 20th days, particularly under extremely high humidity.

All companies recommend increased humidity at hatching time and in the separate hatchers above that carried in the incubating units. Murphy (1930) found that if proper temperature correction was not made with excessively high humidity, a rather large percentage of "sticky chicks" and imperfectly healed navels resulted.

Different means of providing moisture are used. They include moisture pans, moisture pans where the water is agitated and a fine spray produced, pressure water sprays, wet cloths, steam, etc. So far as is known, the means of providing the moisture is not important.

Humidity for Turkey Eggs.—Little research work has been reported on incubation of turkey eggs. Conditions that are optimum for chicken eggs seem to be satisfactory for turkey eggs also, judging from the results secured by hatcherymen. There is some difference of opinion concerning the proper amount of humidity in relation to chicken eggs. Even operating directions of incubator companies are not in exact agreement.

Martin and Insko (1935) state that turkey eggs require as much moisture during incubation as chicken eggs, if not more, especially during the last three days. They recommend a relative humidity of about 60 per cent until just before the eggs pip, when it should be increased to 70 per cent.

Romanoff (1936), on the other hand, states that the relative humidity for turkey eggs during incubation should be 65 per cent,

and at hatching time should be lower than the average by 5 per cent, whereas, for chickens it should be higher than the average by 5 per cent. Apparently, added research is needed as to the proper humidity for turkeys, especially at hatching time, or else there is quite a latitude under which equally good results will be obtained.

Insko, MacLaury, and Ringrose (1942), as a result of experiments in Kentucky, made the following summary and recommendations:

To determine the effect of relative humidity upon the hatchability of turkey eggs in forced-draft incubators two trials were run, involving 6,601 fertile turkey eggs, 11 hatches, and 4 levels of humidity. Two other trials, involving 8,454 fertile turkey eggs and 15 hatches, were run to determine whether discontinuing turning before 24 days of incubation had any effect on hatchability. In these experiments the main findings were:

1. Hatchability from incubation at dry-bulb $99\frac{1}{2}^{\circ}$ F. was significantly poorer with wet-bulb temperature 83° to 84° F. than when the wet-bulb temperature was 85° to 86° F., or 87° to 88° F.

2. Though the differences were not significant, eggs incubated at 87° to 88° F., wet-bulb temperature, for 24 days, hatched better than those incubated at 85° to 86° F., in all five hatches, and better than those incubated at 89° to 90° F., in 4 out of 6 hatches.

3. Relative distribution of embryo mortality through the incubation period was not changed greatly by different humidity levels.

4. In mortality of poults during the first 6 weeks no differences were found which could be attributed to the humidity treatment of the eggs.

5. Comparison of hatching in forced-draft and natural-draft incubators (24th to 28th day) showed a significant difference in favor of the forced-draft machine for eggs incubated at 87° to 88° F., wet-bulb and $99\frac{1}{2}^{\circ}$ F., dry-bulb temperature, for the first 24 days. For eggs carried at 89° to 90° F. for 24 days the difference was not significant.

6. When turning the eggs was stopped on the 18th, 20th, and 22nd days of incubation without an increase in humidity until the 24th day, no significant differences were found between hatchability of these groups and of the groups where turning was stopped the 24th day. Highest hatchability was found in the group where turning was stopped on the 22nd day.

7. When groups of eggs were transferred to hatching trays on the 21st and 24th days of incubation, with an increase in humidity at the time of transfer, a significant difference was found in favor of the 24th day transfer.

PRACTICAL RECOMMENDATIONS

These recommendations, based on the results of the experiments reported in this bulletin, and on other research cited, should be considered supplementary to the recommendations in Ky. Agr. Exp. Sta. Bulletin 359.

1. In a forced-draft incubator, a relative humidity of 61 to 63 per cent during the first 24 days of incubation and an increase to 70 per cent for the last 4 days of incubation should give high hatchability of turkey eggs. For example, an incubator operated at $99\frac{1}{2}^{\circ}$ F., dry-bulb temperature, should have a wet-bulb temperature of 87° to

88° F., during the first 24 days and 90° F., wet-bulb temperature, during the last 4 days of incubation.

2. While incubator moisture had little apparent effect on brooding mortality of poults in this experiment, it appears advisable to avoid incubator wet-bulb temperatures as low as 83° to 84° F., for best brooding results.

3. It is not necessary to transfer eggs incubated in a forced-draft incubator under the above conditions to a natural-draft incubator in order to assure high hatchability. In these experiments hatchability was slightly higher when the hatch was completed in the forced-draft incubator.

4. For more efficient use of incubator space, it is practical to stop turning after the 20th day of incubation and to transfer the eggs to the hatching compartment, but moisture in the hatching compartment should not be raised until the 24th day.

5. Keep complete records on incubator operation including wet-bulb and dry-bulb temperature, time turned and pertinent observations. Such records may be helpful in determining possible causes of poor hatches or may make it possible to duplicate good hatching conditions.

6. Turn the eggs at least four times daily. Turn an uneven number of times if the incubator is not checked during the night hours, so that the eggs will not be in the same position on two successive nights.

7. Study the incubator manufacturer's directions frequently, because failure to observe certain rules may result in poor hatches.

8. Check thermometers and electrical controls at the beginning of each season. A clinical thermometer should be available for this purpose.

9. Rinse the wicks of the wet-bulb thermometers daily and wash them with soap and water once each week. Deposits which accumulate on dirty wicks cause faulty wet-bulb readings.

It is interesting to note in connection with humidity in the incubators that whereas a wet-bulb of 85° to 86° F with a dry-bulb of 99½ gave best results in the Kentucky experiments, the Smith Incubator Company cautions its users to keep the wet-bulb at not over 82° F between hatches with a dry-bulb of not over 99° F. It is well to take into consideration the different recommendations of the different companies with respect to turkey eggs and follow their recommendations. If good results are not obtained, then slight changes should be made in dry and wet-bulb readings in order to find out if improvement can be obtained.

Humidity for Duck Eggs.—Duck eggs seem to hatch better in still-air or paddle air-agitated incubators than they do in forced-draft incubators.

Romanoff (1943) recommends a relative humidity of 70 per cent or higher up to hatching (24th day of incubation), and 60 per cent or lower at the time of hatching, with an incubating temperature of 99¼° F. in a forced-draft incubator (or corresponding average temperature in a still-air type incubator) with a slight drop (about 0.5° F.) at hatching time. His tests indicate substantially less em-

bryonic mortality during the last week of incubation in still-air incubators than in forced-draft incubators.

Hatching Quail, Pheasant and Grouse Eggs.—Experiments in incubating quail, pheasant, and grouse eggs are reviewed in a bulletin by Romanoff, Bump, and Holm (1938) entitled, "Artificial Incubation of Some Upland Game Bird Eggs," published jointly by the New York State Conservation Department and the New York State College of Agriculture.

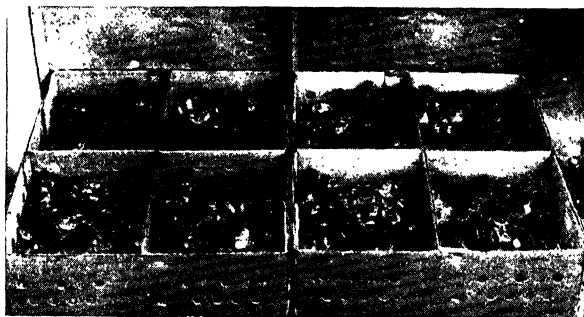


Fig. 71.—Baby pheasants ready to leave the hatchery. (*Hatchery Tribune.*)

Ventilation.—As the embryos develop during incubation, increasing amounts of carbon dioxide are given off and oxygen is taken in. Ventilation removes this carbon dioxide and brings in the oxygen.

Barott (1937) has shown that excess amounts of carbon dioxide in the incubator reduces hatches. With 4 per cent, less than one-fourth as many chicks were produced as with 0.5 per cent; with 2 per cent, the hatch was 35 per cent less than with 0.5 per cent.

He also showed that the best hatches were received when the air contained 21 per cent oxygen and that hatches decreased as the oxygen concentration varied in either direction from this percentage. An increase of concentration, however, was not nearly as harmful as a decrease of the same magnitude.

Romanoff and Romanoff (1933) concluded that an unbalance of air in the incubator, in respect to carbon dioxide and oxygen, has

both direct and indirect undesirable results in the development of the chick embryo.

It is very obvious that if carbon dioxide is given off by the eggs and is harmful in large amounts, the problem of ventilation in cabinet machines, where large numbers of eggs are set in a single compartment, becomes very important. And the larger number of eggs a machine holds, the more important it is. Hatcherymen have long since found out that ventilation with sectional and cabinet machines are two entirely different problems. With section machines, natural ventilation is sufficient, but with cabinets, forced ventilation must be resorted to in order to get sufficient change of air and to maintain uniform temperatures all over the machines.

Ventilation is equally important as a temperature control, and since it is so closely associated with temperature, it is difficult to know exactly the benefits derived from uniform temperature and from fresh air. Many times we receive better results from increased ventilation and conclude the benefits are the results of additional fresh air, when actually, they are due to the controlled temperature resulting. The old Chinese and Egyptian incubators were evidences that no great amount of air is necessary during the early stages of incubation. More air, however, is needed during the later stages.

Many are the hatcherymen who have had sad experiences when their ventilation was insufficient or improper for various reasons, such as fan or paddle troubles, inlets or outlets too small, back drafts, etc. Since the air going into the machines is usually taken from the hatchery room, the importance of having fresh air of about the right temperature in the incubator rooms cannot be over-emphasized.

No specific ventilation directions can be given that will apply to all machines. Incubators vary in size, in means and methods of changing air, and in so many other ways that uniform directions are out of the question. The more reliable companies have experimented and determined the amount of ventilation necessary for best results with their particular machines, and they have provided the proper means and methods of supplying the right amounts of fresh air and removing the old air. Proper sized inlets, outlets, and speed of air change have been determined, and the directions coming with the machines should be followed.

Occasionally, under certain conditions and in some buildings, machines do not perform as they should. In such cases, the company should be immediately called in, an attempt made to find out the trouble, and the necessary steps taken to see that proper ventilation is provided. Oftentimes, fans or paddles go bad, or the speed is slowed up, resulting in trouble. Such things as these should be watched, and at the slightest indication of trouble, all things that might affect ventilation should be checked to see that everything is performing in the proper manner.

Ventilation is also of particular importance in removing excess heat when the weather is hot, especially at hatching time. Often, late in the season, no heat is needed except that given off by the eggs, and even then, it may get too hot in the machines if proper ventilation is not provided to remove this excess heat.

Ventilation in cabinet machines is tremendously important, and it is important in buying an incubator to get one in which this feature has been carefully worked out.

Turning of the Eggs.—Turning of the eggs during incubation is necessary, otherwise the embryos float to the top of the eggs and stick to the shells, which kills them in the great majority of cases. The important point to know is how often to turn. The hen apparently turns the eggs several times daily.

Banner (1920) showed that with no turning, an 18 per cent hatch was secured; with one daily turning, 65 per cent; and with two daily turnings, 77.9 per cent. Lamson and Kirkpatrick (1918) increased the hatch about 6 per cent by turning five times daily as compared to twice. Bittenbender (1931) got an increase of 5.6 per cent hatch in four over two daily turnings. Several other experiments show some advantage in turning at least four times daily. In fact, Olsen and Byerly (1936) turned eggs as often as 48 and 96 times daily with better hatches than when the eggs were turned three times daily by hand. When not turned during the night, the eggs should be turned late in the evening and early in the morning.

With the sectional machines, turning consists in actually turning the eggs by rolling, but with cabinet machines, the turning is usually accomplished by tipping or tilting the trays, so that the eggs are tilted from one side to the other. Many incubators now have automatic turners which turn the eggs automatically at regular periods.

Cooling.—Formerly it was thought necessary to cool eggs, particularly with sectional machines, but the majority of experiments and the experiences of hatcherymen fail to show any advantage and, consequently, it is seldom done any more. With cabinet machines, cooling is not practiced at all. Where cooling is done, the room should be warm, otherwise chilling will result and, no doubt, cause some embryo mortality.

Position of Egg and Jarring.—When eggs are trayed with the little end up, very poor hatches result. It seems necessary for the air cell, which is in the large end of the egg, to be at the upper side if the embryo is to develop naturally.

Olsen and Byerly (1938) found that when eggs were shaken rather violently, there was heavy mortality of the embryos, those between 4 and 13 days being especially susceptible. In these same experiments it was found that the mortality was greatest when the small end of the egg was up.

When eggs are so roughly treated prior to incubation that the air cells are shaken loose, very poor hatches result.

High Altitude Incubation.—Because the humidity, air pressure, density of air, and temperature are different in high altitudes than in low, hatchery operators in high altitude areas may experience some difficulty in obtaining good hatches until certain adjustments are made. Kimball, Moore, and Smith (1945) reported that the percentage of hatch in the United States in 1943 was 68.3 per cent, but the Mountain states ranked lowest with 65 per cent.

North (1941) observed that eggs held for 10 days prior to incubation in a room where additional humidity was provided to bring relative humidity up to about 50 per cent hatched 4 per cent better than when no additional moisture was provided.

Although no data was recorded, North (1944) observed that "strains of chickens secured from low altitudes where their eggs have been hatching satisfactorily will seldom produce good hatches either when their eggs are shipped, or when the birds are transported to this region."

Since embryo growth at high altitudes is slower than at low altitude, North (1944) indicated that an increase in temperature of one-fourth degree or an increase in the relative humidity of 3 per cent prior to actual hatching would accelerate embryo growth and prob-

ably compensate for 7,000 feet of altitude. He made the following recommendations:

During the last few days of incubation (last two days for chicken eggs and last three or four days for turkey eggs), the humidity should be increased and the temperature decreased in forced draft incubators operated at high altitudes. The amount of moisture in the hatcher should be raised until it reaches about 75 per cent at the time the hatching process is progressing most rapidly. Care should be taken to see that the increase in humidity within the hatching compartment is not the result of additional moisture supplied by the wet, newly hatched chicks. . . . Moisture is evaporated very rapidly from newly hatched chicks. For this reason, it is highly desirable that the incoming air should be humidified before it strikes the eggs or wet chicks.

Some hatcherymen operating in high altitudes have found that closing the air intake vents benefited hatchability. This is believed due to the slowing up of evaporation, particularly in forced draft incubators.

Testing the Eggs.—Before the development of cabinet incubators, the eggs were tested twice during the incubation period.

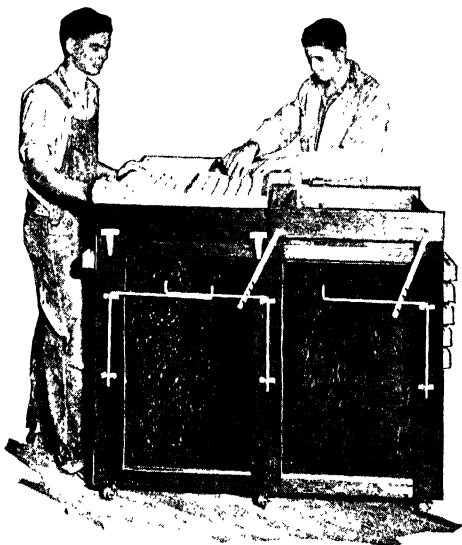


Fig. 72.—Testing eggs just before they are to go into the hatching compartment. The tray of eggs is moved slowly across a narrow light slit, making it easy to remove the infertiles and dead germs. This testing cabinet is also used in trayng eggs. (*Robbins Incubator Co.*)

TABLE XXVII(A).—INCUBATION CHART FOR CHICKS

(T. S. Townsley, Hatchery Tribune, Jan., 1942)

SYMPTOMS OF TROUBLE	PROBABLE CAUSES	SUGGESTED REMEDIES
EGGS CLEAR No blood ring or embryo growth.	1. Improper mating. 2. Eggs too old. 3. Breeding hens too thin. 4. Birds too closely confined.	1. Fight to ten vigorous males per 100 hens. 2. Eggs set within 10 days after date laid. 3. Keep hens in good flesh.
EGGS CANDLING CLEAR But showing blood or very small embryo on breaking.	1. Incubator temperature too high. 2. Badly chilled eggs. 3. Breeding flock out of condition (frozen combs, chicken pox, etc.). 4. Low vitamin ration.	1. Watch incubator temperatures. 2. Protect eggs against freezing temperatures. 3. Do not set eggs from birds with frozen combs or with contagious diseases. 4. Feed fish oil and alfalfa.
DEAD GERMS Embryos dying at from 12 to 18 days.	1. Wrong incubation temperature. 2. Lack of ventilation. 3. Faulty rations.	1. Close temperature regulation. 2. Plenty of fresh air in incubator room and good ventilation of machines. 3. Feed yellow corn, milk, alfalfa meal and fish oil.
CHICK FULLY FORMED But dead without pipping.	1. Improper turning. 2. Heredity. 3. Wrong temperature.	1. Turn eggs four times daily. 2. Select for high hatchability. 3. Watch incubator temperature.
EGGS PIPPED Chick dead in shell.	1. Low average humidity. 2. Low average temperature. 3. Excessive high temperature for short period.	1. Keep wet bulb temperature from 85 to 90 degrees. 2. Maintain proper temperature throughout hatch. 3. Guard against temperature surge.
STICKY CHICKS Shell sticking to chick.	1. Eggs dried down too much. 2. Low humidity at hatching time.	1. Carry wet bulb temperature of 85 degrees between hatches. 2. Increase wet bulb reading to 88-90 degrees when eggs start pipping.
STICKY CHICKS Chicks smeared with egg contents	1. Low average temperature. 2. Small air cell due to too high average humidity.	1. Proper operating temperature. 2. Increase ventilation and lower humidity.
ROUGH NAVELS	1. High temperature or wide temperature variations. 2. Low humidity.	1. Careful operation. 2. Proper humidity.
CHICKS TOO SMALL	1. Small eggs. 2. Low humidity. 3. High temperature.	1. Set nothing under 23 oz. eggs. 2. Maintain proper humidity. 3. Watch incubator temperature.
LARGE SOFT BODIED CHICKS	1. Low average temperature. 2. Poor ventilation.	1. Proper temperature. 2. Adequate ventilation.
MUSHY CHICKS Dead on trays, with bad odor.	1. Navel infection in incubator.	1. Careful fumigation of incubator between hatches.
SHORT DOWN ON CHICKS	1. High temperature. 2. Low humidity.	1. Proper temperature. 2. Careful moisture control.
HATCHING TOO EARLY With bloody navels.	1. Temperature too high.	1. Proper control of temperature.
DRAGGY HATCH Some chicks early, but hatch slow in finishing.	1. Temperature too high.	1. Proper operation.
DELAYED HATCH Eggs not starting to pip until 21st day, or later.	1. Average temperature too low.	1. Watch temperatures—check thermometers.
CRIPPLED CHICKS	1. Cross beak—heredity. 2. Missing eye—abnormal. 3. Crooked toes—temperature. 4. Wry neck—nutrition (?).	1. Careful flock culling. 2. Matter of chance. 3. Watch temperatures. 4. Not fully known.
EXCESSIVE YELLOW COLOR ON CHICKS	1. Too much formaldehyde—fumigation.	1. Follow directions on fumigation program.

Compiled by T. S. Townsley.

TABLE XXVII(B).—INCUBATION CHART FOR TURKEYS
(Smith's Chickagrams, March, 1945)

TYPE OF TROUBLE	PROBABLE CAUSES	INDICATED REMEDIES
EGGS CLEAR after 8 to 10 days of incubation.	1. Eggs held too long. 2. Inferior Toms. 3. Toms too heavy.	1. Do not hold eggs more than 10 days before setting. 2. Use vigorous young Toms, one for each 12-15 hens. 3. Toms should weigh not more than twice as much as hens.
EGGS CANDLING CLEAR, but showing blood trace, or very small embryo when egg is opened.	1. High incubator temperature. 2. Chilled eggs. 3. Breeding flock out of condition.	1. Watch incubator temperature. 2. Keep eggs above freezing. 3. Proper care and feeding of breeding stock.
DEAD GERMS Embryos well developed but dead before pipping shell.	1. Extremes of temperature; either too high or too low. 2. Lack of ventilation. 3. Close inbreeding.	1. Keep temperature carefully adjusted. Avoid overheating. 2. Provide fresh air in building and through incubator. 3. Avoid Brother-Sister matings.
TOO MANY HELP-OUTS Poults well formed, but not getting out of shell.	1. Low humidity at hatching time. 2. Temperature too high in hatching trays.	1. Increase humidity to 88° on wet bulb when eggs pip. 2. Adjust ventilation so heaters are on very little while eggs are pipping.
STICKY OR DROWNED POULTS Eggs pipped, but poults smeared with albumen or drowned in egg liquids.	1. Eggs not properly dried down. 2. Average incubation temperature too low.	1. Keep wet bulb temperature at not over 82° between hatches. 2. Hold temperature at 99° on master thermometer.
HATCHING TOO EARLY	1. Average temperature too high.	1. Hold at 99° throughout hatch.
DELAYED HATCHING	1. Average temperature too low.	1. Watch operating temperature.
ROUGH NAVELS Blood on hatching trays.	1. Temperature too high during fourth week.	1. Avoid overheating from any cause.
CRIPPLED AND SPRADDLED LEGS	1. Extremes of either high or low temperature, especially during first week of incubation.	1. Operate at 99° temperature and 82° wet bulb between hatches, and 99° temperature and 88° wet bulb, during hatch.

Many hatcheries operating sectional machines still do this, but most hatcheries today test only once.

When testing twice, the first test is made on the seventh day when the eggs are transferred to the lower sections. On this test, the infertiles and dead germs are removed. The second test is on the fourteenth day when germs, or embryos, dying after the seventh day are removed. When only testing once with sectional machines, it is done any time from the fourteenth to eighteenth day.

With cabinet machines only one test is made and this on the eighteenth day when the eggs are transferred to the hatching compartments, or separate hatches.

The most common method of testing is simply to pass an electric light under the trays. Reflectors or boxes are often used on lights, so that the light shines out of only a small hole, thus confining the light to one egg at a time. This makes the testing more accurate, but slower. Others build boxes just the size of the egg trays and place several light bulbs in the box. The entire tray is then set over this box which has no top. Still others use a narrow slit, the same width as the trays, in which lights are placed. The trays are then slid over this lighted slit.

Testing must be done at night or in darkened rooms, consequently, much of it is done at night. With some machines, testing can be done at any time, since it is done inside the incubators.

Special candlers with powerful lights and colored lenses have been developed. They make it possible to determine fertile eggs after a few hours of incubation. Various claims are made as to how early accurate determination can be made. Olsen and Knox (1938) state that the most practical time is between 16 and 20 hours.

It was thought at first that this device would cause hatcheries to candle all their eggs after a few hours so that the infertiles could be salvaged and sold on the market. It was also said that hatcherymen would benefit by having more incubator space available, since no space would be taken up by the infertile eggs. In practice, however, the labor of candling and retraying eggs amounts to more than the value of the eggs salvaged, consequently, very few of these candlers are being used.

Disposing of Infertiles, Dead Germs, and Dead-in-Shell-Chicks.—Disposal of infertiles, dead germs, and dead-in-shell-chicks has become quite a problem. Formerly, infertiles could be sold for \$1 to \$3 a case, but today very few are sold. These eggs formerly were supposed to be going to tanneries, but so many were diverted into food channels, such as bakeries, that the Pure Foods and Drugs Administration of the Federal Government made investigations with the result that their sale has been largely stopped. The Government has ruled that 18-day infertiles are unfit for human food, and if any are used for this purpose, the hatchery from which they originally come is held liable, even though the eggs are marked "Unfit for Human Consumption" and sold by some other party.

The only way that infertiles can safely be sold is to break them

at the hatchery and mix them with some material such as birch tar oil, power distillate, kerosene, or coal tar disinfectant, so that there can be no question as to their not being used for food.

Formerly, infertiles were used for chick feed, but because of the possibility of the spread of pullorum disease to the chicks, they are used but little for this purpose any more. Infertiles, however, can safely be used for chick feed if they are cooked thoroughly.

Many hatcheries give them to farmers for hog feed in return for the hauling. Others sell them for a small price to fox farms, while still others simply take them out to the dump or hire someone to haul them away. Arrangements should be made to have them hauled away promptly after testing and hatching days, particularly the latter, because they cause very bad odors and draw flies. Galvanized cans with lids are generally used for holding these eggs until hauled away. Barrels or other containers that leak and have no lids should not be used.

Taking Off the Hatch.—When the hatch is completed, which should not be over 21 days, the chicks should be removed. Where hatching trays are crowded, the first chicks to hatch are often removed before the hatch is completed to provide more room. The shells of those already hatched are removed also. Care must be taken not to chill those still hatching and those still wet if some are removed from the trays before the hatch is completed.

Some hatcheries do their counting and sorting into shipping boxes direct from the hatching trays, while others merely count the chicks hatched, put them in boxes, and then take them to special sorting tables or counters where they are later sorted, counted, and the orders made up ready for delivery or shipment.

With sectional machines, particularly during hot weather, the chicks are allowed to drop down into the nursery trays as they hatch. The nursery trays, being lower, are naturally cooler. During early season hatches when the room temperature is lower, the nursery trays are not used so much.

XI

HATCHERY SANITATION

NO ONE WHO has a clear understanding of the problem of disease in young chicks can fail to realize the fundamental importance of a careful plan of sanitation in the hatchery. Eggs from a few to several hundred flocks come into the hatchery every week. These eggs are all potential sources of disease. The flock owners and purchasers of chicks, all from different places, come into the hatchery and they are all possible means for the introduction of disease into the hatchery.

Importance of Disease Problem.—Every hatcheryman should realize the problem in its entirety, the possibility of disease being brought into the hatchery through eggs and spread over the entire community through infected chicks being sold. This very thing has happened in a great many instances, resulting in heavy financial losses in replacements, and in still greater losses in future business through injury to the reputations of those involved.

Cure is practically impossible in such outbreaks as pullorum disease, infectious bronchitis, and mushy chick disease, hence, once the trouble starts, the hatcheryman is helpless to aid those with the infected chicks. Such temperatures and humidity as exist in hatcheries and incubators are about right for the best development and growth of those types of organisms that cause poultry diseases. The hatcheryman must rely mostly on prevention, and this means careful sanitation.

Create Impression of Cleanliness.—Not only must the hatcheryman practice sanitation, but his place should reveal to the public that every possible precaution is taken. It is a good policy, to have the workers in the hatchery attired in white or light colored coats or overalls; not that white is any better to prevent disease, but it leaves the impression with the public that the utmost care is taken.

The inside of the hatchery should be whitewashed, or painted white, or some other light color. The cobwebs should be continually

removed, and trash never should be left lying around. In short, the hatchery should be an example of cleanliness and orderliness. Above all things, never allow the unhatched eggs and dead-in-shell-chicks to set around after hatches and cause odors. Not only are they poor advertisements, but they are possible sources of disease.

Possible Sources of Infection.—It cannot be stated definitely how certain diseases are carried, because in some cases it is not known exactly what types of organisms cause the diseases, but here are some of the possible ways in which disease organisms may be brought into the hatchery.

1. *Eggs.*—Eggs come from a large number of flocks. It is definitely known that pullorum disease is transmitted through the eggs; whether there are others, has not been proved. It seems logical that the outside of the eggs may carry a number of different organisms. Therefore, a careful system of flock supervision should be maintained and those flocks where trouble develops immediately dropped. A system of monthly, or oftener, flock inspection is very desirable.

2. *Flock owners, customers, visitors, and other people.*

3. *Egg cases.*—These go back and forth between flock owners and hatchery each week. Often egg cases are used that come from poultry and egg dealers.

4. *Culling coops and poultry crates.*—These are usually transported back and forth between hatchery and flocks.

5. *Shipped-in chicks.*—This is, undoubtedly, the most common means of getting infectious bronchitis started.

6. *Returned chick boxes.*—Many people take the boxes home, keep them for several days, or weeks, and then return them to the hatchery.

7. *Brooders.*—Quite often infection gets started in the brooders and then infects the entire hatchery plant.

8. *Sick chickens.*—People often bring their sick chickens into the hatchery to see what the trouble is.

GENERAL SANITATION PROCEDURE

Hatchery Layout.—The hatchery can be so arranged as to largely prevent any infection getting started by carrying out all or some of the following steps.

1. Receive eggs in a special room entirely separate from the incubator room if possible.
2. Allow as few people as possible in the incubator room or incubators. Glass partitions, however, should be provided, so people can plainly see all operations.
3. Have a special sales and equipment display room.
4. Have the brooding room entirely separate from the incubator room.
5. Do not allow people to tramp through the brooder room. Some hatcheries use a glass covered display shelf where started chicks can be seen from the outside, but cannot be handled.
6. Do not permit attendants to wear the same clothes on service work as in the incubator and brooder rooms.
7. Do not allow people to bring sick chickens into the hatchery. Have a special room, or building, if they must be examined.
8. Get the egg shells, dead-in-shell-chicks, and such other material out of the incubator room and into covered utensils immediately.
9. Use signs to enforce these regulations.



Fig. 73.—Frequent flushing of the floor in the incubator room helps to reduce the amount of dust. (*Ohio State University.*)

Sanitation in the Hatchery Building.—Most incubators get the air for ventilation purposes from the room. Since bacteria and germs may be carried by dust, the importance of keeping the floor and walls clean cannot be overestimated. Preferably, the floor should be concrete or other material that can be washed, scrubbed, and flushed.

Dry sweeping stirs up the dust. Where water cannot be used, as on wood floors, sweeping compounds should be used and the floors kept oiled. If the floor can be kept wet or damp, dust can be kept to a minimum. Smooth walls prevent dust from collecting, and they can be more easily washed and painted.

Obviously, the less stuff setting around on the floors the better. Dead chicks, shells, etc., should not be thrown on the floors, but emptied into cans direct from the hatching trays.

Before the start of the season, the inside of the hatchery should be thoroughly cleaned, painted or whitewashed and fumigated. All rooms should be fumigated, and it is not a bad idea to do this regularly throughout the hatching season. If there are any outbreaks of disease, the walls and floor should be carefully sprayed and followed by fumigation.

This applies also to the brooder rooms, only double care should be given to the equipment such as batteries, feeders, etc.

Sanitation in the Incubator.—The incubator is the most important part of the hatchery from a sanitation point of view. Here the eggs are held and the chicks hatched week after week, and where, if there is trouble, infection may take place week after week if the proper precautions are not taken. Temperature and moisture conditions are near ideal for bacterial growth and development. Chick down has been shown in several experiments to carry disease germs. Unless it is removed or completely disinfected, it may carry infection over from one hatch to another. The same applies to other material that might be left in the machines, such as egg shells, dirt, droppings, etc.

Some people use newspapers, wrapping paper, or crinoline on the bottoms of the nursery trays and this material is burned after the hatch. With sectional machines, cloths are often used, and they should be washed and disinfected after each hatch. Occasionally, porous cloth paper, or crinoline is used on the hatching trays of cabinet machines also.

All dust, down, and refuse should be carefully removed from the inside of the machines, preferably with vacuum cleaners designed for use in incubators. The machines should then be cleaned and washed with a good disinfectant, particularly in the case of separate hatchers. Cabinet machines should be fumigated.

Moisture pans in both sectional machines and cabinets, where used, should be emptied after each hatch, disinfected, and fresh water containing disinfectant added.

The first thing then is the careful and complete cleaning of the incubators after each hatch. The trays should be removed, carefully cleaned by scrubbing by hand or electrically driven steel brushes, and then dipped in a tank of good disinfectant.



Fig. 74.—Cleaning a separate hatcher after taking off a hatch. (*Ohio Poultry Improvement Association.*)

Dipping of Eggs.—Dipping of the eggs in a disinfecting solution just prior to being set was practiced a few years back by a large number of hatcheries. The reason for dipping, of course, was to kill



FIG. 75.—Cleaning the incubator with an electric sweeper after the hatch. This is followed by fumigation to kill all germs. (*Ohio State University.*)

disease organisms, coccidiosis in particular, located on the outside of the egg shells. Just how long disease organisms of the various kinds will live on the shells of eggs in incubators is not known. Evidence as to how long coccidia oocysts will live on eggs in incubators

is not known, and the evidence on this point is somewhat contradictory.

Whether properly so or not, most hatcheries no longer dip their hatching eggs. Fumigation is deemed satisfactory by most hatcheries in controlling any disease organisms on the outside of the eggs.

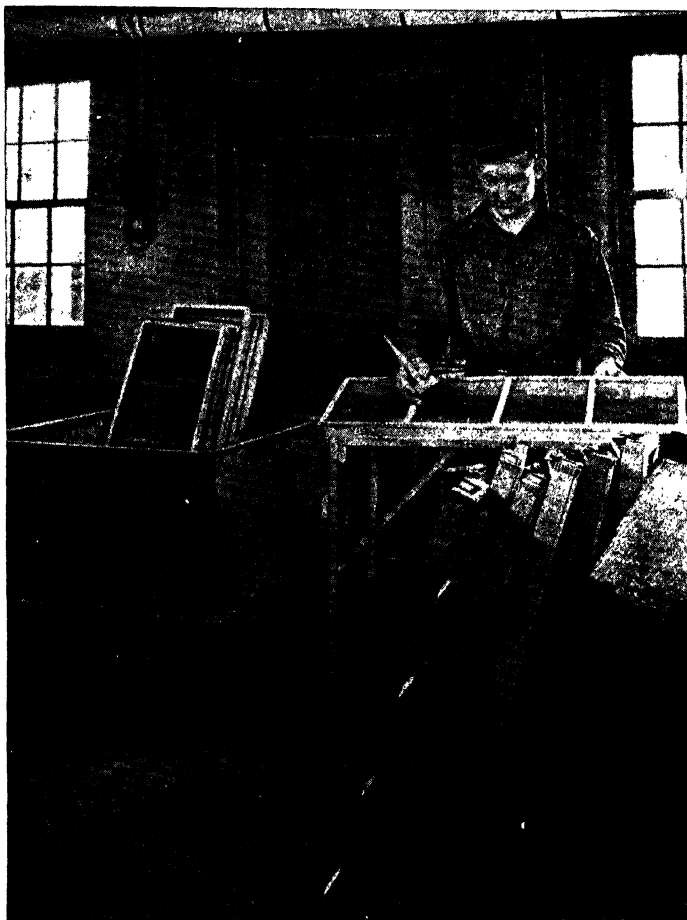


Fig. 76.—Cleaning the incubator trays after the hatch. A stiff wire brush is being used here, after which the trays are placed in a disinfectant vat shown in the background. (*Ohio State University.*)

TRANSMISSION OF PULLORUM DISEASE IN INCUBATORS

It was thought for years by some people, particularly scientists, that pullorum disease (bacillary white diarrhea) could be and was being transmitted or disseminated to chicks by means of the incubator. Hatcherymen in general doubted this. Experiments, however, proved without a doubt that this was, and is a fact.

Hinshaw, Scott, and Payne (1928) reported on studies with forced draft incubators. In each of eight hatches, chicks from disease-free hens were hatched in the same machines with chicks from diseased hens, with the results shown in Table XXVIII. As will be noticed, those in Group II where the disease-free chicks were hatched in the end of the incubator opposite from the diseased chicks, the extent of the infection and the resulting mortality was considerably less than that of the chicks in trays adjoining the diseased chicks, or the diseased chicks themselves.

TABLE XXVIII.—MORTALITY OF CHICKS EXPOSED TO PULLORUM ORGANISMS DURING INCUBATION¹
(After Hinshaw, Scott and Payne)

Group	Hatches	Number of Chicks	Total Mortality	Died, pullorum disease Number	Per cent
I	8	400	175	147	36.8
II	8	441	114	82	18.6
III	8	637	48	0	0
IV	8	603	216	181	30.0

Group I. Chicks hatched from eggs of normal birds incubated on trays adjacent to those from reacting birds.

Group II. Chicks hatched from normal eggs incubated on trays in the opposite end of the incubator from those of reacting hens.

Group III. Chicks hatched from the eggs of non-reactor hens. A separate incubator was used for these chicks. (Controls.)

Group IV. Chicks hatched from eggs of a reactor flock. Hatched in same machine as Groups I and II.

¹ Kansas Technical Bulletin No. 29.

Bunyea and Hall (1930) conducted extensive experiments along this same line, but included sectional or still air machines also. They found that the disease was transmitted in both agitated and still air machines as well as under hens. There was little difference in the amount of transmission in still, or agitated air incubators, or under hens.

How the Organisms are Transmitted.—In practically all incubators, there is always more or less down flying, and this down is undoubtedly the means of transportation of most of the pullorum organisms. Dakan and Speer (1929) took chicks from the eggs of diseased hens and examined them just before they hatched. They found that these chicks were literally bathed in a fluid which contained the organisms. The body of the chick was found to be covered with the organisms.

Bushnell and Payne (1931) found that down was not strictly speaking, down. They state:

Close examination of the down of a chick just hatched will show a number of barbs protruding from one follicle. Each group of barbs is surrounded by a capsule, or sheath much like that of a new feather. As the chick dries and brushes itself against objects, this capsule, or sheath, is broken and in the form of irregular rod shaped pieces makes up a large part of the down found in the incubator after the hatch has been taken off.

This material contains the organisms, and when it is blown all over the incubator, it is easily seen how infection takes place. Dakan and Speer (1929) took air samples from incubators during the hatch after they had been previously disinfected, and with the wet bulb at 90 degrees, the air remained free from organisms for 10 to 12 hours. After this, new down began to fly and the air quickly became contaminated with live organisms. They also took disease free chicks, placed them in a bell jar, and sprayed into the jar a fluid containing the pullorum organisms. These tests showed the chicks to become infected in this manner, and the chicks died in a few days. Post-mortem showed lung infection in every case, and, in some cases, other organs also. Prior to these series of experiments at Kansas and Ohio, it was thought that the organisms were nearly always taken in through the mouth.

Methods of Prevention.—Dakan and Speer (1929) reduced the known spread from infected to non-infected chicks from 40 to 10 per cent by fumigation with formaldehyde gas during the hatch.

Careful experiments were carried on at Kansas to determine the amount of formalin needed to kill the disease organisms and how long it took. It was discovered that just as good results were obtained with the ventilation ports open as closed. This was due to the fact that the germs were killed in a very short time after the gas was liberated.

Experiments also showed that while organisms in the air could be killed, the fumigation had no effect whatever on the organisms inside of the egg, and that fumigation did no good to those chicks getting the disease from the eggs from which they were hatched. These same experiments showed that fumigation when carried out as recommended did not injure the hatchability of the eggs.

• Early experiments attempted a means of continuous fumigation in order to sterilize the outside of the chicks as soon as hatched, since the germs are on the outside of the body. This procedure, however, resulted in a very large percentage of the chicks being killed.

Several experiments by Dakan and Speer (1929) showed that the formaldehyde gas could be liberated while the chicks were hatching without injuring them and still kill the pullorum organisms. These tests also showed that a high humidity was necessary if the chicks were not to be injured by the fumigation.

As a result of these experiments, the Smith Incubator Company and, later, the Buckeye Incubator Company carried on extensive experiments which showed the value of proper fumigation in helping to prevent the transmission from infected or diseased chicks to non-infected or healthy chicks.

Graham and Michael (1933) in their experiments with fumigation with formaldehyde found that it is of definite value in the suppression of pullorum disease, but that it will not completely eliminate losses from this disease when infected eggs are used for hatching and that a careful and sound program of testing the breeding birds and elimination of the infected ones, is necessary if losses from the disease are to be reduced to a minimum.

Graham and Brandley (1937) in experiments found also that fumigation procedures, recommended for the prevention of incubator disseminated pullorum disease, may be effective in destroying certain respiratory infections that have gained entrance to the incubator. *

The exact length of time it takes formaldehyde to kill pullorum organisms in the strengths generally recommended varies apparently under different conditions, some workers reporting as low as 5 minutes, and others reporting longer than this.

Godfrey, Buss, and Winter (1945) found that the bacteria content

of air increased in both separate hatchers and incubator hatchers as the hatch proceeds. The increase is rapid in the early stage of the hatch and slow towards the end. In general, they found that the greater the number of hatching eggs that are hatching per cubic foot of air space, the greater the number of bacteria per cubic foot of air during the hatch. The separate hatchers at hatching time had many more bacteria per cubic foot of air space than the machines where the eggs were hatched in the same machine where incubated. This is due to the greater number of eggs hatching in a smaller amount of space.

In these same experiments, it was found that fumigation by formalin killed the pullorum disease organisms in most cases in five minutes, and in all cases, within 10 minutes in some incubators, and within 30 minutes in others. This difference in killing time was due apparently to the varying amounts of ventilation in the different types of machines. These experiments also showed that in some types of incubators the pullorum disease organisms would be killed several hours after the liberation of the formalin if exposed a sufficient length of time. These same experiments showed the cheese-cloth method of fumigation, as later explained, to be satisfactory and sufficient for the destruction of the pullorum disease organisms.

Influence of Fumigation on Eggs.—The effect of fumigation on eggs in the incubators is naturally of much concern to all hatcherymen, for a large percentage now have some program of fumigation. There have been several experiments conducted to ascertain this information and in general the results are in agreement that eggs can withstand formaldehyde gas in concentrations considerably beyond the germicidal level. Insko, Steele, and Hinton (1941) have reviewed the literature on this point and also conducted some experiments to determine how strong formaldehyde gas can be without embryo mortality losses becoming too heavy and to determine the embryonic stages at which susceptibility is greatest. They summarize these experiments as follows:

1. The experimental work reported involved fumigation of incubating eggs in the range between $3 \times$ and $7 \times$ normal concentration of fumigant, and within this range there was a positive relationship between concentration of fumigant and mortality of embryos. Embryo losses were not great enough to be of practical importance, however, until the concentration of fumigant was more than $4 \times$ normal. Fumigation at normal concentration—about 35 cc. formalin per 100 cubic feet of incubator space—

has been shown by several workers to be relatively harmless to the chick embryo at any stage of incubation.

2. The early "critical period of incubation," the second and third days, was the most critical period in the fumigation of eggs.

3. The use of ammonium hydroxide following fumigation seemed to be more effective in preventing embryo mortality as the concentration of formaldehyde was increased. The chief justification for its use is to shorten the disagreeable effects of fumigation.

Influence of Fumigation on Chicks.—Fumigation with recommended procedures and amounts of formaldehyde does not ordinarily injure the chicks as long as a high humidity is maintained. In fact, Graham and Michael (1933) report a higher livability of chicks from fumigated hatches than from unfumigated hatches. The injury, if any, to chicks was so slight that the losses from pullorum disease spread when not fumigated more than offset any injury done as a result of fumigation.

Most hatcherymen find that little or no harm is done to the chicks from fumigation. Occasionally, however, for reasons often unknown, but generally from giving overdoses by mistake, chicks are injured. These chicks are known as "squeaky" chicks because of the peculiar squeaking noise they make. If badly overfumigated, the lungs become badly discolored and losses may be heavy. Chicks so injured gasp for breath, the eyes are severely irritated as indicated by constant attempts to scratch them with the feet. In severe injury, the tip of the tongue often becomes dry and hardened.

FUMIGATION PRACTICES

Most incubator companies supply directions on how to fumigate their machines, giving the amounts of materials to use for each model, and it is recommended that these be followed.

The amount of fumigation varies among hatcherymen, some fumigating only between hatches, others once while hatching, others twice and three times while hatching in addition to the between-hatch fumigation. Obviously, the better the testing program, the less need for fumigation while hatching. Conversely, the poorer the testing program and, hence, greater flock infection, the greater the need and importance of fumigation while chicks are hatching.

It is often recommended that chicks be removed after each fumigation when fumigating more than once while hatching. Some hatch-

eries, however, leave the chicks in for more than one fumigation with no apparent injury. Leaving them in may often explain the overfumigated or "squeaky" chicks occasionally encountered. Every hatchery should fumigate between each hatch as a minimum program in order to prevent any infection hanging over from one hatch to the next.

Fumigation colors white chicks slightly yellow, which is preferred by most hatcherymen to the pure white or nearly white of unfumigated chicks. Some commercial fumigants color chicks very yellow. It is often recommended that a small amount of fumigant be set in a dish in the incubator while the chicks are hatching, but it is very questionable whether the release in this manner is rapid enough to kill the disease organisms.

Fumigation is practiced generally only in cabinet machines, although a few do fumigate each tray of sectional machines by releasing a small amount of formaldehyde with potassium permanganate in each section of the hatching tiers. A few hatcheries using sectional machines fumigate their entire incubator room once each week, claiming that this practice reduces chick mortality. Their trouble is due to the fact that the infection remains in the hatchery, in dust and down, and becomes worse with each hatch as the season progresses.

Insko, Steele, and Hinton (1941) offer the following practical recommendations as a result of their experiments and those of others:

1. The incubator and eggs should be clean and should otherwise conform to the best practices in sanitation.

2. Fumigation at high concentrations should not be made during the first three days of incubation because the embryos are then most susceptible to formaldehyde.

3. Eggs in the separate hatching compartments of an incubator should be fumigated on the 18th to 20th days of incubation.

4. Eggs may be fumigated at time of hatching, but in no case should fumigation be delayed until the chicks have dried.

5. The formalin should be standard 40-per cent, commercial grade. It should be stored in a well-stoppered bottle.

WARNING: Do not permit formalin to come in direct contact with the hands, for it may cause serious skin trouble. Wear rubber gloves when handling it.

6. Potassium permanganate should be kept in a colored bottle or moisture-proof container.

7. Just before fumigation the humidity in the incubator should be raised to 92-94° F. wet-bulb reading. The fumigation should be performed at normal operating temperature.

8. Fumigation by the permanganate method requires the following items:

- (1) Measuring graduate or bottle for the formalin.

- (2) Small balances or standardized measure for the permanganate.
- (3) Large earthenware or enameled dish for combining formalin and permanganate. A large enameled wash basin or cooking utensil may be used.

9. Effective germicidal fumigation for pullorum by the permanganate method requires about 35 cc. of 40-per cent formalin and 17.5 grams of potassium permanganate per 100 cubic feet. Converted to the standard usually employed by hatcherymen, this proportion is equivalent to 1.2 fluid ounces of formalin and 0.6 ounce permanganate per 100 cubic feet.

10. The dish should be placed on the floor of the incubator (or in the intake air channel), the permanganate placed in the dish, and the formalin poured over the permanganate.

11. Ammonium hydroxide may be used after fumigation to shorten the period in which the disagreeable odor of formaldehyde is present. Some reduction in embryo mortality may occur with its use.

12. Control of mushy-chick disease requires two to three times stronger fumigation than the control of pullorum. Seventy to 100 cc. formalin and 35 to 50 grams permanganate per 100 cubic feet is the concentration recommended for effective control of mushy-chick disease.

Mortality with $3 \times$ normal fumigation is not serious, and if necessary the treatment could be increased still more, provided the fumigating is done after the 4th day of incubation.

13. Fumigation by the cheesecloth method requires the following items:

- (1) Measuring graduate or bottle for the formalin.
- (2) Cheesecloth of appropriate size.
- (3) Small hooks, tacks, or rods, for holding cloth in place.
- (4) Bucket or basin in which to immerse cheesecloth in the formalin.
- (5) Rubber gloves to be worn while handling the cheesecloth saturated with formalin. *Warning! Serious skin trouble may occur if formalin comes in direct contact with the hands.*

14. When the cheesecloth method is used, pieces of cheesecloth about 1 yard square should be immersed in a sufficient quantity of formalin to supply 20 cc. formalin per 100 cubic feet in incubator space. The cloth should then be hung over rods near the fan and allowed to remain for 3 hours. (This method requires approximately two-thirds the quantity of formalin needed in the permanganate method.)

15. Treatment by either method should last not less than 1 hour nor more than 3 hours.

16. If suitable measuring and weighing facilities are not available the operator should consult his local pharmacist or photographer about the weighing or measuring of the needed materials.

17. The recommendations of the incubator manufacturer should be considered in fumigating with formaldehyde.

For those who do not have detailed directions for fumigating, we reprint in part from the University of Illinois Circular 403 by Graham and Michael who have done considerable research on this subject:

Disinfecting Values of the Two Methods of Fumigation.—The results of these experiments indicate that either the potassium permanganate method or the formalized cheesecloth method of fumigation of incubators, if properly dispatched, is valuable in reducing the dissemination of pullorum disease in incubators. The method to be employed is optional. The individual hatcheryman will probably obtain the best

results with the method that he can employ most accurately. It is not safe to assume that the results of fumigation may be precisely the same in different incubators unless the rate of air change, humidity, temperature, and physical cleanliness are comparable. Incubator fumigation is regarded as a relative procedure, having maximum efficiency in clean incubators and well-ventilated rooms.

COMPARATIVE COSTS

About 60 per cent of the formalin used during a hatch by the potassium permanganate method is saved when the cheesecloth method is followed. Moreover, the latter method does not require the use of potassium permanganate. With both methods an additional fumigation 24 hours before each hatch is recommended.

Two fumigations by the cheesecloth method or three by the potassium permanganate method are ordinarily employed during a hatch. For a single fumigation by the cheesecloth method 20 cc. of formalin per 100 cubic feet of incubator space in Incubator A and approximately 17 cc. per 100 cubic feet of space in Incubator B were germicidal to *S. pullorum* when the wet bulb reading was 90-92° F. and the dry bulb 99-100° F. These amounts were 66½ per cent and 57 per cent, respectively, of the amounts used in the potassium permanganate method for a single release of formaldehyde. For one entire hatch the cheesecloth method required in Incubator B 44.4 per cent, and in Incubator A only 38 per cent, of the formalin employed in the potassium permanganate method to produce about the same germicidal effects.

DOUBLE FUMIGATION BEFORE HATCHES

Twenty-four hours *before* each hatch, it is advisable to give the incubator a double-strength fumigation in order to destroy latent or mass infection. Double-strength fumigations are also recommended for disinfection of clean incubators at the start of the hatching season.

Eggs will not be injured by repeated fumigations with double amounts of formalin, but chicks should not be exposed to these amounts. Hatching chicks are tolerant to amounts of formaldehyde that possess distinct germicidal properties for *S. pullorum*, but chicks of low vitality or chicks that harbor pullorum disease may be injured by routine fumigation. Chicks more than 48 hours old should not be subjected to formaldehyde fumigation.

FORMOLIZED CHEESECLOTH METHOD OF INCUBATOR FUMIGATION

The relative humidity of the air inside the incubator should be approximately 68 per cent (a wet bulb reading of 90° F. when the dry bulb reading is 100° F.). Proper humidity reduces the circulation of dust particles and down, favors hatching, and facilitates the germicidal action of formaldehyde. During the time hatching chicks are being fumigated, the ventilating fan should be kept running. *Avoid using old solutions of formalin which have been allowed to stand exposed to the air or in bottles insecurely stoppered.*

MATERIALS AND EQUIPMENT

(1) Formalin (commercial solution of 40-per cent formaldehyde, aqueous solution); (2) measuring cylinder; (3) clean cheesecloth; (4) small rod (preferably glass) or wire hooks, depending on type of incubator.

PROCEDURE WITH FORCED-DRAFT INCUBATOR TYPE A

1. Compute the number of cubic feet of air space in the incubator (length times width times height).
2. Cut cheesecloth into pieces approximately one yard square.
3. Place a glass rod in such a position that when the cheesecloth is hung over it the cloth will be as near the fan as possible without interfering with its movement. If the incubator has more than two fans, one piece of cheesecloth may be used for each fan or a double-sized piece hung near one fan.



Fig. 77.—Fumigating Type A incubator, where operator works from outside, with formalized cheesecloth. Dip the cheesecloth into the computed amount of formalin. After all the formalin is absorbed, hang the cloth over a glass rod as near the fans as possible without interfering with their action. The cheesecloth should be large enough to absorb all the formalin without becoming wet enough to drip.

(*Illinois College of Agriculture Cir. 403.*)

4. Measure out 20 cubic centimeters ($\frac{2}{3}$ ounce) of formalin for each 100 cubic feet of incubator^a space.
5. Dip the cheesecloth into the formalin, using enough cloth to absorb all the formalin without becoming wet enough to drip.
6. After all the formalin has been absorbed by the cloth, promptly hand it over the rod and close the door of the incubator (Fig. 77).
7. Let formalized cheesecloth remain in the incubator until at least three hours after the release of the formaldehyde. At this time all dry chicks should be removed.
8. Only two fumigations during each hatching period are necessary with the cheesecloth method. Give the first when one-tenth to one-fifth of the chicks are out of the eggs, and the second, 12 to 15 hours later.

TABLE XXIX.—APPROXIMATE CONVERSION TABLE OF WEIGHTS AND MEASURES
(Ky. Agr. Exp. Sta. Bul. 416)

Fluid measure	1 fluid ounce = 30 cubic centimeters (cc.)
	1 pint = 16 ounces = 473 cubic centimeters (cc.)
	1 cubic centimeter = .0381 fluid ounces
Weights	1 liter = 1,000 cubic centimeters = 33.81 fluid ounces, or slightly more than 1 quart
	1 ounce (avoirdupois) = 28 grams
	1 pound (avoirdupois) = 16 ounces = 454 grams
	1 gram = 15 grains = .035 ounce (avoirdupois)
	1,000 grams = 2 pounds, 3 ounces, and 120 grains, or about 2.2 pounds

PROCEDURE WITH FORCED-DRAFT INCUBATOR TYPE B

- 1, 2. Proceed as directed under 1 and 2 above.
3. Use a piece of cheesecloth large enough to absorb all the formalin ($1\frac{1}{2}$ yards



Fig. 78.—Fumigating Type B forced-draft incubator, where operator can get inside, with formalized cheesecloth. Picture at left shows formalizing the cheesecloth. The formalin is measured into a small container, such as a half-pint milk bottle. Then the cloth is thrust into the formalin and the container inverted. The formalin is absorbed almost instantly. The formalized cloth is then removed from bottle and hooked under the screened fan in a hammock-like manner. Picture at right shows cheesecloth suspended under fans after it has been formalized. (*Illinois College of Agriculture Cir. 403.*)

will absorb 100 cc.). Hang the cloth under one of the fans by means of small wire hooks so that the cloth spreads out as much as possible.

4. Measure out $16\frac{2}{3}$ cubic centimeters (.56 ounce) of formalin for each 100 cubic feet of incubator¹ space.

5. Turn off the fans and thrust the cheesecloth into a milk bottle or fruit jar containing the proper amount of formalin. Invert the container and allow the formalin to be completely absorbed (Fig. 78, left). This absorption requires only a few seconds.

6. As soon as the cloth has been formalized, remove the container, fasten the free end of the cloth under another fan, close the door of the incubator, and turn on the fans (Fig. 78, right).

7, 8. Proceed as in 7 and 8 above.

POTASSIUM PERMANGANATE METHOD OF INCUBATOR FUMIGATION

The same conditions of humidity, temperature, and cleanliness as required for fumigation with cheesecloth are employed in releasing formaldehyde with potassium permanganate.

MATERIALS AND EQUIPMENT

(1) Potassium permanganate crystals; (2) formalin (commercial solution of 40-per cent formaldehyde, aqueous solution); (3) measuring cylinder; (4) deep enamel pan.

PROCEDURE WITH FORCED-DRAFT INCUBATOR, TYPE A OR B

1. Compute the number of cubic feet of air space in the incubator (length times width times height).

2. For each 100 cubic feet of incubator space, use 35 cubic centimeters of formalin ($1\frac{1}{8}$ ounces) and 17.5 grams ($\frac{9}{10}$ ounce) of potassium permanganate.³ If more than 17.5 grams of potassium permanganate is used, it will simply be lost—the chicks will not be injured. If, however, more than 35 cubic centimeters of formalin is used, the chicks may be injured.

3. Place the calculated amount of potassium permanganate in an enamel pan large enough to hold about ten times the quantity of material used. Do not use glass or earthenware containers, for the heat generated by the chemical combination of formalin and potassium permanganate may be great enough to break them.

4. Set this pan into the central compartment of the incubator below the fan. For large incubators more than one pan may be necessary. In some forced-draft incubators the fumigating materials may be placed in a broad, shallow pan which is set in a cabinet under the intake pipe. Leave damper in the intake pipe wide open so that the gas can pass freely into the incubator.

5. Pour the computed amount of formalin over the permanganate crystals and close the door of the incubator as quickly as possible. The formaldehyde gas is liberated immediately (Fig. 79).

6. Do not open the incubator until 3 hours after the release of formaldehyde, if maximum germicidal results are desired. At the end of this time the chicks should be removed from the incubator and placed in clean, new boxes or brooders.

7. Three fumigations 12 hours apart should be made during the course of the hatch. Make the first shortly after the first chicks have come out of the egg. In experiments conducted at the Illinois Experiment Station, a few chicks subjected to three

fumigations showed transitory symptoms of irritation. The number of chicks that have died from the effect of fumigation has not been important, fatalities being confined largely to subnormal chicks.

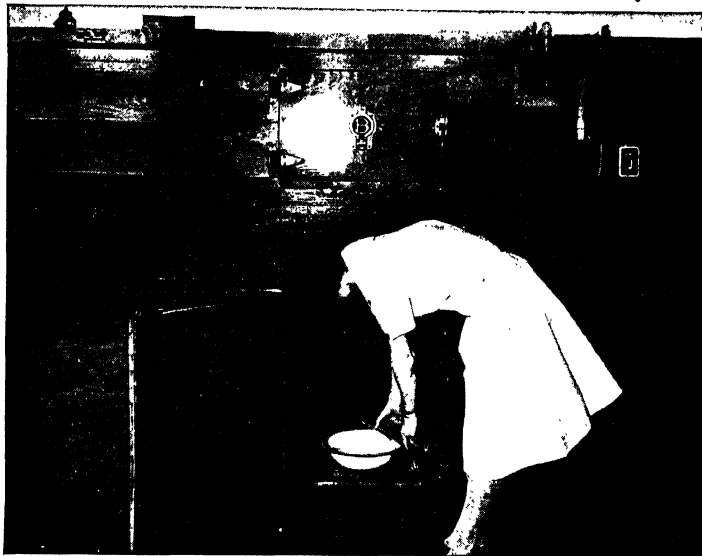


Fig. 79.—Fumigating Type A forced-draft incubator, where the operator works from the outside, with potassium permanganate and formalin. Pour the computed amount of formalin over the potassium permanganate crystals in a pan large enough to prevent splashing and close the door of the incubator immediately. (*Illinois College of Agriculture Circ. 403.*)

Use of Ammonia to Neutralize Formaldehyde.—Ammonium hydroxide is quite often used to neutralize the formaldehyde gas, especially by those who use the type of incubators in which the operators must work inside. When exceptionally heavy fumigation is used to control mushy chick disease or where fumes remain unduly long, the use of ammonia at the end of the fumigation period may help to reduce possible injury to the embryos and enable persons to work in the incubators without discomfort.

Different authorities recommend slightly different amounts of ammonia, varying from about three-quarters of the amount of formaldehyde to the same amount. It is liberated by the cheesecloth

method as a rule in the same manner as formaldehyde, but the same cloths should not be used for both materials. Ammonium hydroxide of 26 to 29 per cent should be used.

Fumigation of Separate Hatchers.—Godfrey, Buss and Winter (1945), found that the bacterial content of air in separate hatchers while chicks are hatching runs much higher than in incubators where the hatching compartments are in conjunction with setting trays. One would suspect this due to the fact that all the down from a hatch is congregated in a much smaller area. These bacteria have not all been identified and they are likely not all dangerous, but it can well be imagined that disease producing organisms are present in large numbers also. For this reason, fumigation of separate hatches is important.

Most hatcheries fumigate hatchers by the cheesecloth method, because in certain types of hatchers, it is difficult to find the necessary space for the containers when the potassium permanganate method is used. In some hatchers, the cloth is hung horizontally, being attached at each side of the hatcher. In others, it is hung vertically in front of the hatching trays. In still others, it is possible to hang the cloth over a rod where space is available. In those types where paddle or wheel air agitators circulate the air, care must be used to keep the cloth away from these agitators.

Some companies put out special directions for fumigating hatchers, and these directions should be followed.

If trials result in injury as indicated by gasping or "squeaky" chicks, the amount of formaldehyde should be decreased.

Fumigating Incubator Rooms.—A few hatcheries make it a practice of regularly fumigating their entire incubator rooms once every two or three weeks. They claim it keeps down possible infections that might result from accumulated dust and down which cannot be reached by ordinary cleaning methods. This is particularly true with certain types of incubators where it is difficult to remove all dust and down because it collects in inaccessible places in and around the incubators. Where this practice is followed, it is important that good ventilation be provided so that following fumigation the room can be quickly and thoroughly aired. Exhaust fans will facilitate such procedure.

Germicidal Lamps.—While not much research data is available on the use of germicidal lamps in hatcheries or incubators, some hatcheries have installed them in their buildings at various places. It has been demonstrated that these lamps will destroy disease organisms, but for the greatest effectiveness, it appears that the organisms must be in the direct rays. Moreover, the length of time required to kill them will depend upon the distance the organisms are from the lamp.

In unpublished data, A. R. Winter of Ohio State University found that the use of these lamps in incubators in most cases resulted in a reduction of the bacteria count, but not sufficient to be practical. The probable reasons are that the air circulates too rapidly and that there are so many places in which the disease organisms are hidden from the direct rays.

When used in incubators, germicidal lamps should be located so that they do not shine in the eyes of the chicks otherwise, for blindness may result.

Influence of Humidity on the Spread of Pullorum Disease.—High humidity in the incubator causes the chicks to dry more slowly, and this means a longer time before the down starts to circulate. Also, it makes the down much heavier, so that less of it circulates than in dry machines. This was proven experimentally at the Kansas Experiment Station by taking air samples at various degrees of humidity.

It was further shown that the higher the humidity at hatching time, the less the spread of pullorum disease. Table XXX shows this quite conclusively. Since it was also shown that less down and fewer organisms circulated with high moisture, this is good proof that the spread of infection in incubators is largely by the down.

MUSHY CHICKS

Mushy chick disease is one trouble that many hatcherymen experience sooner or later. Coons (1932) has made a study of this trouble and we quote from him as follows:

A study by the writer of many baby chick losses in the hatching trays and shipping boxes of certain hatcheries showed that these losses were due to spore-forming germs, found on contaminated trays, which infect the chicks by way of the unclosed navel at the time of hatching.

In past years hatcherymen in different sections of the country have noticed that when certain chicks died in hatching trays or in the shipping boxes it was only a short time before the chicks became "mushy" and gave off a very offensive odor. Unless a number of chicks were lost, little attention was given to this condition. It was generally thought that these chicks were weak in vitality or had been hatched from overheated or chilled eggs. However, bacteriological studies show that these chicks, which were just as healthy as the other chicks at the time of hatching, evidently became infected through the umbilicus, or navel, before it had time to close after hatching.

TABLE XXX.—INFLUENCE OF HUMIDITY ON SPREAD OF PULLORUM DISEASE
IN INCUBATORS
(Bushnell and Payne, 1931)

Wet-bulb reading (F.)	Per cent Hatchability	Number of Chicks	Mortality due to Pullorum Disease	
			Number	Per cent
Group I				
75	57.2	410	91	22.19
85	59.4	168	21	12.50
95	42.1	271	31	11.43
Group II				
75	57.0	202	40	19.80
85	60.9	117	15	12.82
95	53.5	249	3	1.20
Group III				
75	55.0	195	48	24.61
85	54.7	105	15	14.28
95	50.8	248	1	.40
Group IV				
Control	...	464	0	0.00

Group I. Chicks from the reactor flock.

Group II. Chicks from a normal flock exposed in the same end of the machine with the Group I chicks.

Group III. Normal chicks exposed in the opposite end of the machine from Groups I and II.

Group IV. Control chicks from a normal flock hatched in a separate machine.

Spore-Forming Germs Cause Trouble.—Spore-forming germs that get into the incubator on the outside of eggs, contaminated in the latter part of the egg-laying organs of the hen, are the cause of mushy chick disease. These germs are quite frequently found in the intestines of fowls, but are harmless unless they get into a deep wound or into some opening, such as the navel, which later closes. The reason why these organisms then become pathogenic is because they grow only in the absence of oxygen or free air. Therefore, if the navel should become contaminated with these germs before it closes, it would serve as an ideal place for them to go ahead and multiply.

When trays, contaminated with these germs, are not properly cleaned between hatches they become a source of infection to the chicks that hatch out. Shortly after the chick emerges from the shell and before the navel has had time to close, it

scrambles and flounders around on the hatching tray. This results in the unclosed navel becoming contaminated with anything that might be on the tray. Naturally, if any of the spore-forming germs should be on the hatching tray they would gain entrance into the body through the navel and start multiplying after its closure.

Diagnosis is Easy.—Chicks dying from mushy chick disease give off a very offensive odor that is so characteristic one should not have any difficulty in recognizing the disease. In addition, within one hour after the chick dies all of the muscles and internal organs are completely liquified, or turned to water. If one were to try to lift the dead chick out of the tray or chick box by grasping the toe, the skin of the leg would part and leave the bones of the leg dangling from the toe. The dead chick has the appearance of having been flattened out by someone stepping on it.

Mortality Rate Varies.—The number of chicks which die of mushy chick disease varies in different hatcheries. This depends upon the amount of contamination on the hatching trays. In some cases, the mortality rate varies from 1 to 5 per cent. In others, it runs as high as 15 per cent. In some hatcheries so many chicks have died of the disease that the operators were forced to close down.

If the affected chicks are examined closely, a black ring starts at the navel and spreads over the abdomen. In some cases, the blackened area spreads very rapidly, killing the chick within one hour after it is first noticed. In other cases, the chick may linger for a long time. In the latter case, the shanks shrivel up, the feathers become roughened and characteristic odor can be noticed coming from the navel region.

Fumigation Prevents Disease.—Fortunately, the organisms which cause mushy chick disease belong to that class of bacteria which includes lockjaw, botulism and blackleg germs. All of these germs are very susceptible to formaldehyde gas. This fact was immediately made use of in combating the disease. Experiments showed that formaldehyde fumigation is highly effective. 115 C.C. of formalin added to 58 grams of potassium permanganate for every 100 cubic feet of space are necessary to kill the organisms causing this disease. The temperature should be at least 99 degrees and the wet bulb reading about 90. Eight minutes after liberating the formaldehyde, the doors of the incubator should be opened so as to permit the rapid escape of the gas in the machine. This amount of formaldehyde gas will not injure the fertility of the eggs, but is too strong to use when chicks are in the machine. The gas should only be used between hatches. By using this amount of formaldehyde gas at frequent intervals between hatches, trouble with mushy chick disease can easily be avoided.

INFECTIOUS BRONCHITIS

One of the worst problems, from an infectious disease standpoint, that hatcherymen have to meet and solve is that of infectious bronchitis. Outbreaks occur practically every year, usually when surpluses occur and the battery brooders are well filled, although they may occur at any time. And they are so common that most hatcherymen are pretty badly worried when they have large numbers of chicks in batteries.

Cause.—The cause of the disease has been established as a filterable virus and this virus is present in infected chicks in the exudate of the trachea and nose and, some research work indicates, also in the liver, spleen, kidneys, and blood.

It is not known definitely in what manner the disease can be transmitted except that exposing normal chicks to chicks infected with the disease nearly always results in the normal chicks getting it. Most outbreaks in hatcheries can be traced to bringing in infected chicks. Once it is started in a hatchery or brooding plant, it spreads rapidly to nearly all chicks. How else the disease is spread is not known, although it is generally believed that people can carry it after being around infected chicks. Many more chicks are exposed than commonly thought, due to the fact that hatcheries which have the disease often continue to ship chicks and, hence, other chicks in the same mail or express cars are exposed.



Fig. 80.—Gasping is the principal symptom of infectious bronchitis in chicks.

The disease is especially bad in hatcheries where chicks in batteries are infected and spread the infection all through the hatchery, exposing each batch of newly hatched chicks. This continues generally as long as the infection is present in the batteries, except when the battery rooms are completely shut off from the incubator rooms by air-tight partitions and no direct communication is present, the persons taking care of the battery rooms not being permitted in the incubator rooms. Observations would indicate that the disease is certainly carried in the air. Since filterable virus organisms are so

small they cannot be seen with a microscope, this is rather easy to imagine.

Symptoms.—The principal symptom is the typical gasping. Chicks stand around and stretch out their necks attempting to get air through the windpipe or trachea to the lungs. This difficulty in breathing is due to a collection of mucus in the windpipe preventing the passage of air, and when bad enough, results in the chicks dying from lack of air. Mortality varies from few or no losses up to practically 100 per cent.

From observation, there is apparently a great difference in the virulence of different strains of the disease or in the resistance of different groups of chicks, and this difference seems to vary according to localities. The outbreaks are very sudden, chicks getting it when not over 2 to 5 days out of the incubators.

In hatcheries where there are serious outbreaks, nearly all chicks hatched become infected and nearly all brooder chicks in the hatchery get it.

Control Methods.—Prevention of the disease is much more economical than cleaning it up after an outbreak. The following precautions, or as many as possible, should be taken:

1. Never put "shipped in" chicks in the brooder room.
2. Don't bring "shipped in" chicks in the hatchery if it can be avoided.
3. Don't let people in the brooder room. They may have just come from a hatchery where the infection is present.
4. Have the brooder room separated from the incubator room by airtight partitions, or if possible separate buildings, or on separate floors with separate outside entrances.
5. Never let anyone bring sick chicks in the hatchery or brooder rooms.
6. Don't bring back to the hatchery "used" chick boxes.
7. If chick sexors come to the hatchery, be certain they have not been to hatcheries that have the infection, or make them change clothes before they come in.

Once the infection is present, the only safe procedure is to thoroughly clean up. It does not seem possible to "wear out" the disease, because each new bunch gets it. The following procedure has im-

mediately stopped the infection in any number of cases observed by the authors, and it seems to be the only procedure to control the infection.

1. Remove absolutely every live chick from the hatchery and brooder rooms. Take them elsewhere and never bring them back to the hatchery or brooder room.

2. Thoroughly clean and disinfect all brooders. Wash walls and floors.

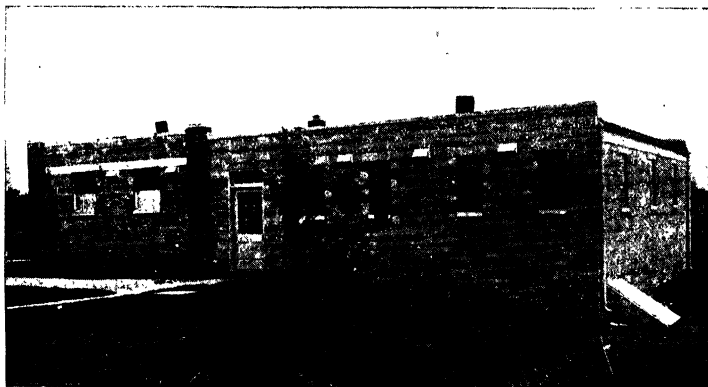


Fig. 81.—This battery brooding building of the Hubbard Farms hatchery is completely separated from the building in which the chicks are hatched, the chicks in batteries being cared for by an attendant who has nothing to do with the hatching operations, (*Hubbard Farms.*)

3. Fumigate all rooms after seeing that the humidity is high, using one pint of formaldehyde and 8 ounces of potassium permanganate for each 1,000 cubic feet of air space. Do not air out for at least 30 minutes, preferably one hour and longer. Where no hatching eggs are present, it can be used in greater strength as indicated in chart showing common disinfectants.

4. Generally one thorough fumigation will clean up the situation but, for safety's sake, it should be repeated after two or three days.

5. Do not permit anyone taking care of infected chicks to come in the hatchery.

DISINFECTANTS

Since hatcherymen use and sell disinfectants, and since poultrymen and farmers expect hatcherymen to know about them, it is thought wise to give a brief discussion on this subject. The following statements are taken from the U.S.D.A. Bulletin, *Some Common Disinfectants*, by M. Dorset:

The word "infected" means contaminated with or affected by disease germs; "disinfected" means freed of disease germs. A "disinfectant" is a product that destroys disease germs or renders them harmless. An "antiseptic" is a substance that prevents the development and growth of disease germs, but an antiseptic is not a disinfectant unless it is capable of destroying disease germs in addition to preventing their growth.

A disinfectant is not necessarily an "insecticide," for some powerful disinfectants are relatively harmless for insects and good insecticides may be of little value as disinfectants.

Formaldehyde is a powerful disinfectant, but it is a very weak insecticide, and conversely, hydrocyanic acid is deadly for insects and all forms of animal life, while it has little power as a germicide or disinfectant. It is well to remember also that "deodorants" are not necessary disinfectants—one destroys odors, the other destroys germs.

No single disinfectant is appropriate in all cases. Select the proper substance, apply liberally, allow ample time for the disinfectant to do its work, and remember that success depends in large part upon the care and exactness of the person who prepares and applies the disinfectant.

USE OF DDT

DDT has come into use for controlling lice on chickens, flies in hatchery and poultry buildings, cockroaches in hatcheries and for many other purposes. Its effectiveness has been demonstrated. Tests at Maryland have shown that its use in hatcheries when used as a dust had no adverse effect on hatchability and was effective in destroying cockroaches.

COMMON-DISINFECTANTS ¹

Disinfectant	Strength Used	Purpose	Cautions
Formaldehyde	5 per cent.	Interior of houses, coops, etc. Incubators.	Irritating to mucous membranes. Hardens the skin.
Formaldehyde gas	1½ lbs. potassium permanganate, 3 pts. formaldehyde, 1000 cu. ft.	Poultry houses. Hatchery room.	Tight house, temp. 60° or above. Sufficient moisture.
Formaldehyde gas	40 cc. formalin, 20 grams potassium permanganate to 100 cu. ft.	Force draft incubator.	99° to 100° temperature 90° wet bulb reading.
Bichloride of mercury	1-1000	Soil, 1 gal. to each 10 sq. ft.	Never use on metals. Do not allow to stand a long time in wooden containers. Do not use to disinfect albuminous material. After use on soil keep fowls off run for 1 week.
	1-6000	Drinking	Containers should be of earthenware, never metal or wood.
Silver nitrate	10 per cent solution	Mouth, nasal cavity, wounds, vent.	Never make solutions with tap water. Do not use in presence of chlorides. Not a general disinfectant.
Argyrol	10 to 15 per cent solution	Eyes particularly, also mouth, nasal cavity.	Not a general disinfectant.
Unslaked lime	Sprinkled on soil	Poultry runs, filthy puddles, manure.	Sprinkle with water after placing on soil. Keep fowls off runs for 1 week.

Whitewash	Slake 4 lbs. lime with 1 qt. water and dilute to proper consistency.	Interior of houses.	Use freshly prepared.
Sulfur	Burn 5 lbs. to every 1000 cu. ft. of space.	Poultry houses.	House must be tight, temp. over 60° sufficient. Attacks metals, therefore should not be used in incubators.
Iodine	Tincture	Wounds	Never use as a general disinfectant. Do not use on metal.
"Chlorinated lime"	20 per cent solution	Droppings, filthy pools, dropping boards. Wash drinking vessels. Good deodorant.	Not often used as a general disinfectant.
Liquor Cresolis and crude carbolic acid	2 to 5 per cent solution	Interior of poultry houses. Incubators.	Used as a general disinfectant.
Carbolic acid	5 per cent. 1-1000	Washing drinking vessels. Wounds. Drinking water.	Too costly for general disinfectant.
Potassium permanganate	1-500 to 1-1000	Drinking water. Wounds.	Never used as a general disinfectant.

¹ *Ohio Agr. Ext. Bul. 90.*

XII

GETTING THE CHICKS TO THE CUSTOMER

SHORTLY BEFORE a chick hatches, the yolk is drawn into its body through the navel. Because the yolk, which is largely carbohydrate material, is not completely assimilated until the chick is about 72 or more hours old, the yolk serves as the chick's food supply during that period. That is why it is possible to ship chicks long distances. Were it not for this fact, it is likely that the hatchery industry would not have reached its present size as rapidly as it did, for mail order hatcheries represent the first stage in the development of the modern hatchery industry.

Standardization of Chick Boxes.—Prior to the adoption of standard sizes for chick shipping containers, hatcherymen shipped

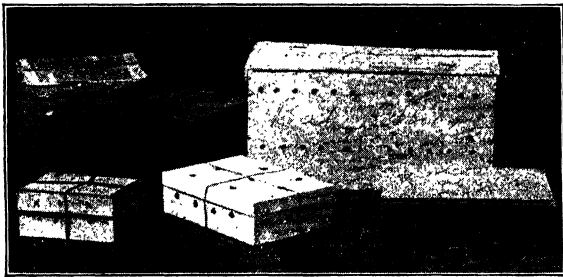


Fig. 82.—Types of chick shipping containers used before chick boxes were standardized.

chicks in shoe boxes, cheese boxes, used egg cases that had been converted into two-story affairs, as well as in specially made boxes, for each hatcheryman had his own ideas as to the most suitable type of container and how it should be ventilated. Express companies, therefore, found it difficult and annoying to handle the great variety of boxes, and losses of chicks in transit were frequently heavy.

Realizing the need for standardization of chick shipping containers, the International Baby Chick Association soon after its organization in 1916 concluded that efforts in this direction were desirable, but it was not until the association held its annual convention in Chicago in 1918 that real progress was made. Acting upon the suggestion of postal authorities that parcel post shipments of baby chicks would be greatly facilitated if a standard size container were agreed upon, President Herbert H. Knapp appointed a committee which, after a lengthy session, recommended the sizes that are still standard.

Types of Shipping Boxes.—Boxes intended for use in the shipment of day-old chicks are generally made of corrugated board and come in the following sizes:

100-chick size: 22 inches by 18 inches by $5\frac{1}{2}$ inches, to contain four compartments.

50-chick size: 18 inches by 11 inches by $5\frac{1}{2}$ inches, to contain two compartments.

25-chick size: 9 inches by 11 inches by $5\frac{1}{2}$ inches, to contain one compartment.

12-chick size: 6 inches by 8 inches by $5\frac{1}{2}$ inches, to contain one compartment.

Although the sizes recommended by the International Baby Chick Association proved to be very satisfactory for day-old chicks during the greater part of the chick season, hatcherymen found that these boxes did not provide adequate space, air and ventilation during the summer heat. The association directors in 1923, therefore, recommended a warm weather box of larger dimensions and having more head room to be made in the following sizes:

100-chick size: 18 inches by 24 inches by 6 inches, inside dimensions.

50-chick size: 12 inches by 18 inches by 6 inches, inside dimensions.

25-chick size: 9 inches by 12 inches by 6 inches, inside dimensions.

With the development of the started chick business, manufacturers brought out boxes designed for the shipment of 3-weeks-old chicks, the age at which started chicks seem best able to stand shipment. These boxes are equipped with feed hoppers and water fountains, but for overnight or short distance shipping, it is not necessary to use the feeders or fountains.

In purchasing chick boxes, consideration should be given to strength of the box, ease of assembling, means of ventilation, general attractiveness, as well as special features. One manufacturer has developed a box which may be used as a brooder for about three days after the arrival of the chicks. Feed holes are punched out in the

sides of the box. The box may be placed upon a paper on the floor, and the mash is poured on the paper all around the box. Because chicks are attracted by light, they soon learn to eat the mash and find the water in the fountains.

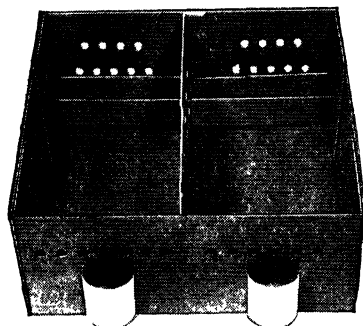


Fig. 83.—A 3-week started chick box in the 50-chick size. Mash feeders are inside; water cups outside. (*Anderson Box Company and Hatchery Tribune.*)

Special size boxes are made for shipping turkey poults. On the basis of tests made in shipping baby poults in regular poult boxes and standard size chick boxes, a North Carolina hatchery found that better results were secured with the chick boxes. Just 20 poults were placed in each of the four compartments. The resultant bunching prevented chilling, and it also forced the weaker poults to stay on their feet. The reduced headroom also minimized the danger of the stronger poults piling on the weaker poults and causing death by suffocation.

Setting Up Chick Shipping Boxes.—Baby chick shipping boxes come in knocked down condition, making it necessary for the hatcheryman to set them up and put them together. Hatcheries with a very limited output may get along with a hand stapling tool in assembling the boxes, but most hatcheries will find it desirable to use hand or foot power stapling machines, while large operators will save time with motor driven staplers or stitchers.

Ventilating sticks are applied to the covers of boxes, unless the

boxes happen to be of the stickless type. The recommended practice is to apply six-inch sticks, preferably redwood because of its lightness, across the four corners of surface and projecting just a little beyond the edge of the box to prevent the placing of anything right up against the sides of the box and stopping ventilation. The use of these short sticks instead of two long strips across the box not only places the strain where the box is strongest, but permits circulation of air in four directions instead of in just two.

Some of the stapling and stitching machines can be used in applying these sticks, but other operators simply glue them on to the boxes. A thin film of glue is poured into a shallow pan. One side of the stick is dipped into the glue and then placed in a position diagonally across the corners of the cover.

To prevent chicks from slipping around in the boxes during transit, and to absorb droppings, material such as wood wool is placed in the bottom of the boxes. Wood wool can be obtained in bulk or in pads already cut to fit various sized box compartments.

Ventilating Chick Boxes.—Ventilation in chick boxes is secured through "punch-out" holes located in the sides and cover of the box. The amount of ventilation to provide will depend upon prevailing weather conditions and upon the destination of the shipment, and the hatchery operator will have to use his own judgment, because there are so many conditions beyond his control. A north bound shipment will require less ventilation as it strikes cooler weather, while a shipment starting in Indiana and consigned to Florida will need more and more ventilation as it goes southward. Weather reports should be studied closely.

Vondell (1929) questioned 66 New England hatcherymen and arrived at the following recommendations for ventilating one compartment of a 100-chick box, with slightly less ventilation for a 25-chick box:

Punch Out on Top	Temp.	Punch Out on Sides
10 Holes	80°	8 Holes
6 Holes	70°	8 Holes
3 Holes	60°	8 Holes
0 Holes	50°	6 Holes
0 Holes	40°	4 Holes
0 Holes	30°	2 Holes

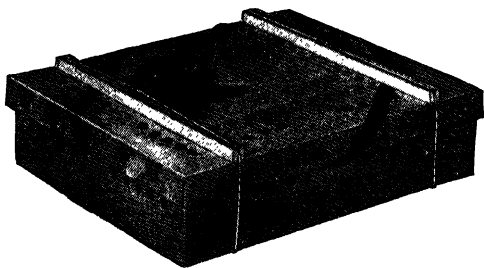


Fig. 84.—The use of a wire tying machine insures a tight closure.

Tying Chick Boxes.—Chick boxes are usually secured by tying with a heavy twine, sometimes colored in order to add to the attractiveness of the package, but many hatcherymen have adopted the practice of tying their boxes with copper wire by means of a special tying machine. This method insures a tight closure and prevents opening of the box and subsequent chilling of the chicks during transit.



Fig. 85.—When shipping either baby chicks or started chicks, arrangements should be made for delivery to the railroad station shortly before train time, so that the chick boxes do not have to stand on the platform too long. (*Ohio Poultry Improvement Association.*)

Know Shipping Regulations.—Hatcherymen doing a mail order business should make themselves familiar with the postal and express regulations concerning the shipment of baby chicks. For example, express shipments of chicks must reach their destination within 48 hours, while parcel post shipments have a 72-hour limit.

The hatchery operator, furthermore, should know train schedules in order to get the chicks to the postoffice or express office in ample time, yet not so early that the boxes of chicks stand around a long time before being placed on the train. Chilling or overheating is apt to occur during long waits.

The use of pre-cancelled stamps, so that the chicks can be taken direct to the railroad station and put on trains, will help to avoid the danger of long delays at the postoffice.

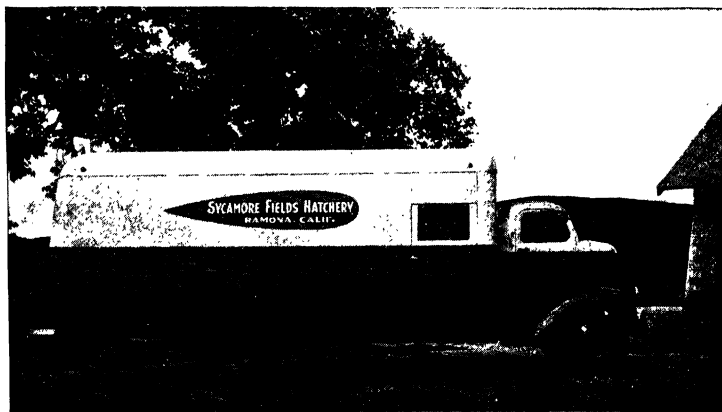


Fig. 86.—This truck, used to haul turkey poults for the Ramona (Calif.) Co-operative Turkey Producers, is equipped with an electric plant which furnishes current for nine fans, two heaters, and a blower system that maintain a temperature of 75 degrees F. and insure proper air circulation for a load of 12,500 poults.

Delivery of Chicks by Truck.—Where hatchery competition is keen and where a sale is made by being able to deliver the chicks to the customer's door, the practice of delivering chicks right to the poultry raiser has come into general existence. Since many chicks are chilled when taken away from the hatchery by the customers,

the hatcheryman can often get the chicks to the customer in much better condition by delivering the chicks himself.

An Ohio hatcheryman varied this method somewhat. He established delivery depots at some well known store in each of the towns in his territory. On regular days each week during the hatching season, the hatchery truck delivered chicks to these depots where the customers, who had been notified in advance, called for them.

Many hatcherymen have devised special methods of heating and ventilating their delivery trucks. One western hatchery organization has a panel body truck ventilated with a scoop shaped funnel that sucks in fresh air which is distributed equally to all parts of the trucks. There are two suction fans at the back, and these are controlled by a switch at the driver's seat. Four outlets in the roof provide for the escape of the air and help to maintain an even temperature. The thermometers can be observed from the driver's seat.

The delivery man should be more than a truck driver. He should be a trained poultryman who is capable of answering the questions of the customer and is able to make the proper suggestions on getting the chicks safely started. A Pacific Coast hatchery has a policy of refusing to deliver the chicks if the delivery man finds that the customer is not prepared to take care of them.

Shipping Hints.—Early in 1945, the International Baby Chick Association issued the following suggestions to hatcherymen for shipping baby chicks and baby poults with the objective of reducing losses between the hatchery and the customer:

1. Notify the customer several days in advance of the probable arrival time.
2. Use a strong chick box. Counter boxes were not intended for long shipments.
3. Use two labels on each bundle . . . one on the top and one on the side. It reduces handling of the chicks by clerks as they attempt to route the bundles.
4. Use only two boxes per bundle. Heavier bundles strain the binding agent and also are more difficult to spot in the car.
5. Use spacing sticks on all bundles and on single boxes, too. You have no assurance that your single boxes will always be at the top of the stack.
6. Ship only to destinations which can be reached normally in 60 hours. For poults, the recommendation is 48 hours.
7. Use excelsior pads on the floor of the boxes.
8. Address on label should include county as well as city and state. Don't abbreviate "state" and write plainly.
9. Watch carbon monoxide in delivery truck.
10. Use over-size boxes in warm weather, or reduce number of chicks in standard box.

11. Label all poult shipments as such.

12. Plan the routing of your chicks. Avoid congested terminals where transfers are necessary whenever possible.

Cull Before Shipping.—When taking a hatch off, the customary procedure is to box the chicks without any attempt to get an accurate count, and later take them to a culling or sorting table where they are carefully counted, examined and sorted before boxing up and sending them out to customers. This culling should be done in a room where a reasonably high temperature can be maintained and where there is no danger of drafts. The table itself should be arranged, so that there is no chance of the chicks falling on the floor. There should also be plenty of light. Ralph E. Waldo, writing in *The Baby Chick*, described an arrangement for culling and counting chicks:

Two men work together in selecting and counting the chicks. A box of chicks, fresh from the incubator, is placed on the left side of the table. One man scoops the chicks out onto the sorting screen, which is walled in to prevent the chicks from wandering away. The screen consists of one-fourth-inch hardware mesh raised one-half inch from the table. Under this is spread gypsum. This gives us a white background which shows up the chicks to advantage and the screen prevents the disagreeable accumulation of moisture from the droppings.

The man who does the culling picks up five good chicks at a time. There is no mental effort to count these, as three chicks are picked up in one hand and two in the other. They are then dropped into one corner of the box at the right of the table. As the right hand is drawn back, the index finger presses the lever of the mechanical counter. This tally counter is arranged to register by fives so the total chicks in the box shows on the machine. When 100 chicks are in the box the tally shows zero, and it is then time to start to fill another box.

There is another counter which is used to record the cull chicks as they are placed in the cull box. This only counts by ones and the lever is pressed for each cull chick that is boxed. By keeping track of the culls, we have a check on the quality of the eggs and also the general run of chicks.

Qualities to look for in chicks to send out should include:

1. *Health and vigor* as shown by round bright eyes, sturdy legs, deep pigmentation of shanks and beaks of yellow skin varieties, pinkish tinge to shanks and beaks of white skin varieties, long down, well developed head.

2. *Good size.*—Each 100 chicks should weigh at least 8 pounds. Failure to do so may be due to setting small eggs or to faulty incubation.

3. *Trueness to breed.*—Color, symmetry, and type should conform to the breed. Single combs in rose comb varieties are common and should be removed.

4. *Freedom from deformities and defects* such as crooked legs and toes, crooked beaks, side sprigs on single combs, eyes missing, eyes stuck shut, pasty vents, imperfectly healed navels, sticky down, etc.

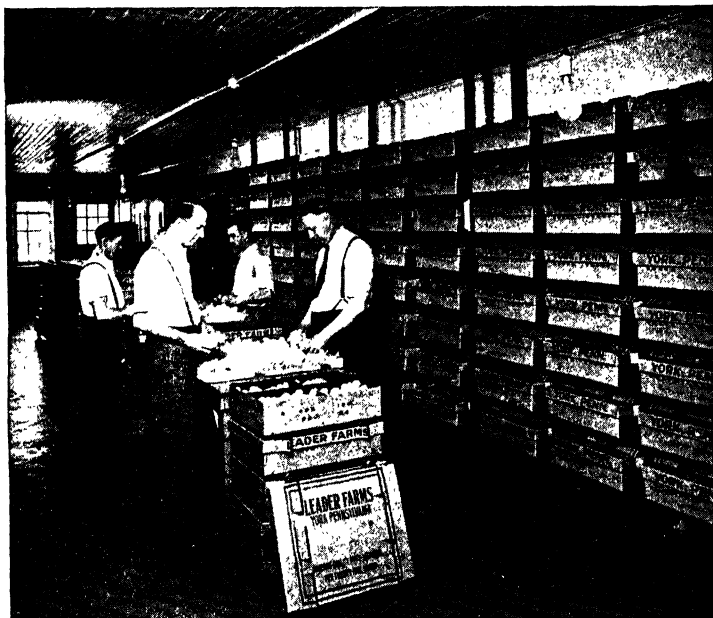


Fig. 87.—Sorting and boxing chicks prior to delivery or shipment. Note the neat racks in background for holding the boxed chicks until they are ready to move out of the hatchery. (Guy A. Leader.)

Give Customers Feeding Instructions.—When an order of baby chicks goes out from the hatchery, it should be accompanied by specific instructions on how to feed and care for those chicks. Failure to make definite recommendations too often results in a disastrous brooding season for the purchaser with the possibility that the hatcheryman's chicks may not enjoy a favorable reputation in that community.

To avoid a situation like this, some hatcherymen publish their own chick manual to give to their customers, while others simply use some well written feeding booklets supplied by a commercial

feed manufacturer. Some feed manufacturers supply shipping labels containing a brief summary of directions on how to start the chicks. This puts the instructions right before the chick buyer where he cannot miss them. When the buyer calls at the hatchery for his chicks, or if the chicks are delivered by truck, a few of the most important points in starting the chicks should be emphasized verbally.

Probably the most important information to get across to the customer is the time to feed the newly hatched chicks. Poultry raisers have been told for years not to feed the chicks before they were 72 hours old. These directions were often misconstrued with the result that some people waited as much as 72 hours after the arrival of the chicks before feeding, causing starvation of the chicks.

Although newly hatched chicks can go 72 hours or longer without feed and not suffer any ill effects, work at a number of experiment stations has shown that feeding of chicks 24 to 48 hours after hatching results in greater growth. Furthermore, early feeding does not retard yolk absorption, nor does it cause bowel trouble. In shipments to distant customers, stress the point that the chicks should be *fed immediately upon arrival*. Local buyers should be advised as to the time for the first feed.

So that its customers may be prepared for the chicks when they arrive, a California hatchery sends out the following letter when acknowledging orders:

A copy of your order is enclosed and under separate cover we are sending you "Starting Chicks Right with the Ten Commandments of Baby Chick Raising." Note shipping date.

In just a short time you will receive your baby chicks. Have you sufficient feeders, hoppers and fountains? Every chick should have one inch of feeding space. Five hundred chicks require five hoppers four feet long with feeding room on both sides. Each 100 chicks should have at least a one-gallon fountain for water and buttermilk.

Have you one or more reliable brooder thermometers?

Is your brooder house thoroughly cleaned, washed and disinfected? Is your brooder stove clean and in running order? It should be running two or three days before the chicks are expected, to get it perfectly regulated.

Have you some fresh chick feed? Do not try to use what you had left over last year.

Have you notified your postmaster or express agent that you are expecting the chicks?

Be sure to examine the chicks upon arrival to see that they are in good condition. Remember we guarantee full count and live arrival and we must be notified at once if the chicks are dead, weak or missing.

If we can help you in any way please let us know at once.

We always include extras in case of loss. Count the live chicks.

XIII

THE BATTERY BROODER

It is NOT the purpose of this chapter to give a complete discussion of all phases of battery brooding, but rather to discuss it only in its relation to the hatchery business. Therefore, such factors as feeding, temperature, humidity, etc., will not be taken up.

Surplus Chicks.—Most hatcheries have battery brooders for the purpose of taking care of surplus chicks until such time as they can



Fig. 88.—Battery brooders provide a temporary means of handling chick surpluses.

be sold. These periods of surplus chicks may be the result of a few days of very bad weather which delays chick purchases, a sudden drop in egg prices which may slow up buying and cause actual cancellations, or failure of customers to call for their chicks at the time promised. When these periods extend over two or three weeks, the regular hatchings that are coming off must be taken care of. Ample battery space will take care of the chicks until settings can be stopped.

The fact that many hatcheries reduce prices the minute demand does not keep up with production has resulted in a tendency among

chick buyers to wait for lower prices and to come in and get their chicks when they are ready for them, rather than place their orders ahead. This means setting without orders, which means more gambling as to whether the chicks will be sold. Hatcheries that gamble on having buyers when the hatch comes off certainly should have considerable battery brooding space.

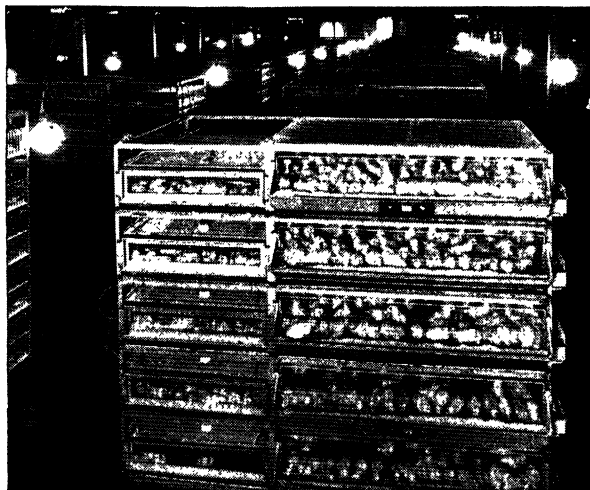


Fig. 89.—Brooder room of a large producer of started pullets.
(*Hatchery Tribune.*)

When surpluses are heavy and brooders full of chicks, many hatcherymen dispose of their day-old chicks through wholesale outlets at low prices rather than attempt to brood them and sell them later at sacrifice prices. Most hatcherymen, however, have come to the conclusion that the most profitable method is to have batteries available for emergencies, but to brood as few chicks as possible.

When reasonable care is taken to prevent exceedingly large surpluses, battery brooders will provide a temporary means of handling these surpluses, helping to postpone and prevent price cutting. Surplus chicks that cannot be handled inevitably lead to price cutting.

Started Chicks.—The chick hatchery survey conducted by Termohlen, Warren, and Lamson (1940) revealed that 64.9 per cent of

all hatcheries in the United States sold started chicks in the 1937-38 season. It was less prevalent in the Atlantic and Pacific coast states than in the Midwest. Some hatcheries sell started chicks as an integral part of their business, while others sell them only when they have unsold baby chicks.

In some communities practically all hatcheries have large battery capacities and a large percentage of the business is started chicks; in others, people still prefer day-old chicks. A few make a business of selling four and six-weeks old pullets, the cockerels being sold cheap for broiler purposes and, in a few cases, raised for broilers by the hatchery. Most hatcheries, however, sell at whatever age they can, and are glad to do so. Very little trouble from moving chicks at different ages is reported.

People who have had trouble with heavy chick losses during the first two or three weeks are apt to be anxious to get started chicks which are past this dangerous age. As a rule, fewer losses will be had in batteries during the first three weeks than under the ordinary brooder.

Prices.—The price received for started chicks is, of course, the key to the whole problem. If hatcherymen can make a profit in selling started chicks, they naturally will do it; if they can't, they will do as little as possible. In figuring costs, many hatcherymen have failed to include much of anything except feed, leaving labor, mortality, battery depreciation, fuel, space rent, etc., to be taken care of by including them in the general hatchery expense.

Most of those who have any figures feel they must have at least 2 to 2½ cents the first and second weeks, and 3 to 4 cents the third. At four weeks and after, the pullets and cockerels, as a rule, are sold separately, a flat rate being charged.

Some hatcheries have been able consistently to get prices for started chicks which will enable them to make a profit. Where the brooding equipment of the buyers is not ample and early losses have been heavy, some people are willing to pay the price. In other cases, where large numbers of pullets are needed, but where there is only a limited brooding capacity, satisfactory prices for four- and six-week-old pullets are obtained.

But generally speaking, hatcherymen often have not been able to get the prices necessary to come out even on their cost of brood-

ing, let alone make a profit. Most people prefer started chicks, but at low prices. The tendency on the part of some hatcherymen seems to be, therefore, to sell day-old chicks at low wholesale prices rather than take a chance and brood them. Cases of where three, four and five-weeks old chicks have been sold at day old prices, when the brooders were full, have been plentiful, and most hatcherymen prefer not to take these chances.

It is true that fewer losses will be had in the batteries than under hovers, but the big question is: Is the cost to the chick buyer, who already has the equipment anyhow, greater than it would be if he did it himself, all factors considered? And if the hatcheryman can do it for less, can he convince the buyers?

The hatcherymen, however, can afford to take a loss on a few hundred chicks in the brooders if he can maintain his day old prices on thousands, and to date, this is the greatest service of the battery brooder to the great mass of hatcheries.

Flock Testing Purposes.—The battery brooder has been a great factor in giving hatcherymen a line on the livability of chicks from different flocks. Prior to the use of brooders by hatcheries, the tendency was to blame all chick troubles on the buyers.

Brooder tests by the hatcheries have shown that the chicks from certain flocks do not live well even under ideal conditions. The result has been the dropping of such flocks and a general improvement in the quality of flocks used and, hence, in the chicks produced. The battery brooder has taught and is teaching the hatcherymen more about his own chicks than he has ever known or could find out in any other way.

A few hatcheries make it a practice to check periodically on a few chicks from each flock. This is certainly a commendable procedure.

Display Purposes.—Battery brooders are used quite generally to display chicks, both for customers coming in the hatchery and for those just passing by. For this purpose, they are very good, both from display and sanitary points of view. The chicks are easily and quickly shown to the customer and are nearly always in good condition.

Dangers of the Battery Brooder.—There are some dangers and disadvantages in battery brooders. Some of these are:

1. The tendency for hatcheries to overset without orders, because

they feel they have the batteries to take care of surpluses. They often overset more than the brooder capacity.

2. Actual loss on brooding operations, due to inability to get satisfactory prices on started chicks.

3. Tendency to force lower day-old prices, if started chick prices have already been forced too low, or if people see that the brooders are filled.

4. Extra investment required in space, equipment, feed, etc.



Fig. 90.—Chicks show up to advantage when displayed in battery brooders.

5. Danger of getting infection, such as infectious bronchitis, started in the hatchery and infecting all chicks hatched.

6. Danger of heavy brooder losses, particularly when crowded or if an infection gets started.

7. Injury to the reputation of the hatchery, if brooder troubles are experienced. This reputation hangs over from one season to the next. Once a serious infection of bronchitis is generally known to exist, people don't easily forget.

Types of Battery Brooders.—Generally speaking, there are two types of battery brooders, the heated room type, and the heated compartment type.

Heated Room.—With this type, the entire room is kept at or near a uniform temperature. In large rooms, where chicks of varying ages are kept, the temperature is usually kept lower at one end for the older chicks. In other cases, several different rooms are provided with different temperatures to correspond to the ages of the chicks.

These rooms are heated with brooder stoves, gas stoves and heaters, steam and hot water pipes, and by other methods. The air is circulated by means of fans in most cases, although occasionally distribution is secured largely by natural means with the aid of properly devised and arranged ventilation systems.

Some of these rooms are provided with commercial automatic heating, regulating, and heat distribution and circulation devices. Others are completely built and installed by commercial concerns, and include batteries, heating and ventilation equipment, etc.

Battery brooders have undergone many improvements since they were first introduced in the late twenties. While some hatcherymen have built their own battery brooders, generally, they can be bought more economically, and their operation is likely to be much simpler than the homemade models. In buying a battery brooder, it is important to see that the chicks are not hindered in eating, that the chicks will not fall out on the floor, and that the feeder openings can be adjusted as the chicks grow.

Individually Heated Batteries, or Trays.—With this type, each tray is individually heated, usually by electricity, and the temperature in each tray can be regulated separately. The trays, or compartments, generally are divided into a warm section where the heat is provided, and an outside section which is at or near room temperature, the chicks having access to whichever section they prefer.

While this type of battery was formerly used largely for displaying chicks, it is now used extensively in heated battery rooms. The use of supplementary room heat reduces the amount of electric current consumed by the separate battery units.

Some of the older types of battery brooders, still found on many poultry farms and in hatcheries, are built in tiers or sections, and each tier, or section is kept at the same temperature. Hot water is the usual method of heating, the arrangement being somewhat similar to the old sectional, hot water incubator.

XIV

CHICK SEXING

THE ART of determining the sex of baby chicks by examination for the presence or absence of the male organ was introduced to America in the spring of 1933 when several Japanese sexing experts lectured and conducted laboratory exercises at colleges and experiment stations in British Columbia, Washington, Oregon, and California. A practical demonstration of the speed and accuracy of this method of sexing was given by Japan's champion chick sexor the following August at the International Baby Chick Association's convention in Grand Rapids, Michigan.

Extent of Chick Sexing.—Practically all large hatcheries now sell sexed chicks, and a large proportion of small hatcheries can now supply sexed chicks by utilizing the services of chick sexing organizations.

Of the chicks hatched by commercial hatcheries in 1943, some 16 per cent consisted of sexed chicks, according to Kimball, Moore and Smith (1945). The percentage of sexed chicks to total chicks hatched ranged from less than 1 per cent in Nevada, Wyoming, and Alabama to 34 per cent in Michigan and Wisconsin.

On the basis of reports from flock owners as to their chick purchases, the U. S. Department of Agriculture estimated that 76.7 per cent of the chicks bought in 1945 were straight-run; 18.5 per cent, pullet chicks; and 4.8 per cent, cockerel chicks. The Pacific Coast states led in the percentage of pullet chicks bought, the figure being 33 per cent. Next in rank were the New England States with 29 per cent pullet chicks.

Sexing is not so extensive in the general purpose breeds as it is in White Leghorns. Broiler growers, however, prefer to get cockerel chicks of the heavier breeds and varieties whenever possible, because growth is more rapid than it is in pullets.

Advantages and Disadvantages.—Chick sexing has made it possible for the flock owner to buy all pullet chicks instead of having

to provide equipment and housing, feed, and labor for cockerel chicks until they can be identified and removed from the flock, or held until they reach a marketable age. This has been a particularly strong point on White Leghorns which frequently suffer price discrimination in poultry markets because of their small size. Normally, thousands of Leghorn cockerel chicks are gassed, drowned or killed in order to dispose of them.

Sexing has made it possible for hatcheries to purchase sexed pedigreed day-old cockerels from breeders, placing these chicks with their regular flock owners to raise for the breeding cockerels to head the flocks the following year. It eliminates the hazard of introducing various diseases, a danger which exists when bringing mature or partly grown cockerels into a flock. For the breeder, it reduces the number of cockerels he has to raise, takes less equipment and labor, and is generally more profitable.

A strong argument against sexed chicks is that there is a tendency for many flock owners to put as many pullet chicks into a brooder house as they would straight-run chicks. Since there are no cockerels to remove, it results in crowding, causing heavier losses during the rearing period.

Darrah (1943), reporting on a survey of 80 New York poultry farms for 1940-41, found that the net cost to raise a pullet from straight-run chicks of the light breeds was \$1.02 against \$1.15 per pullet from sexed pullet chicks. The difference was more pronounced in heavy breeds, the straight-run pullets costing only 96 cents compared to \$1.32 for the sexed pullets. The spread was due to the fact that returns from cockerels marketed as meat offset the higher feed and labor cost of raising straight-run chicks.

Hatcherymen who do not want to be bothered with sexed chicks sometimes bring out these points on the disadvantages of sexed chicks, as they apply to their local conditions, in their literature.

Methods of Getting Sexing Done.—Since sexing requires trained operators, most large hatcheries with sufficient volume maintain their own sexors who work only for the hatcheries where located. These sexors may be persons within the organization who have been trained, or they may be sexors hired for the season or the year.

The majority of hatcheries, however, do not have sufficient volume

of sexing to maintain full-time sexors. Occasionally, an employee who does regular hatchery work may have acquired sufficient skill to do what sexing is necessary. Usually, the sexing is done by sexors employed by an organization, or by independent sexors who maintain a regular schedule, visiting each hatchery once or twice a week at a certain time, sexing the chicks, and moving on to the next hatchery on the route.

Sexing services have sprung up in all parts of the country. These organizations employ skilled operators, locating them so that they can handle the service for a large number of hatcheries with a minimum of driving. Such organizations sell their services, contract to do the sexing at a specific amount per chick, pay the sexors, and arrange the routes that are to be covered by each sexor. The life of a chick sexor is a hard and gruelling one, especially during the height of the hatching season when it requires considerable driving and long hours of work to take care of the volume of chicks that must be sexed on schedule.

Cost of Sexing.—In the earlier days of chick sexing, the sexing charge ranged from 1 to 2 cents a chick. As more expert sexors became available, prices dropped to a range of $\frac{3}{4}$ of 1 cent to $1\frac{1}{2}$ cents per chick. In some instances, if the volume is especially heavy, the charge may be as low as one-half cent. Where routes are operated, the cost of getting from one hatchery to another is usually added, charging on a mileage basis.

It is said that a good chick sexor, when hurried, can sex as many as 2,000 chicks an hour, but the general rate is much lower, probably averaging less than 1,000 chicks an hour. The speed, as does accuracy, of course, varies with individuals.

Pricing Sexed Chicks.—Since sexing is not 100 per cent accurate, it may require more than 100 straight-run chicks to obtain 50 pullet chicks. Where the cockerels cannot be sold, obviously, this makes it necessary to price the pullets at more than double the straight-run chicks, accounting for the extra 1 or 2 cents per chick added by many hatchery operators after they double the price. This is the method generally used in pricing Leghorn pullet chicks, for normally the cockerels have to be sold at very low prices or killed to dispose of them.

Pricing of sexed chicks of the general purpose breeds is different,

for usually the cockerel chicks are in demand as broiler chicks. Usually, pullet chicks of Barred and White Plymouth Rocks bring from 3 to 5 cents more than the cockerel chicks. In areas where Rhode Island Red or New Hampshire broilers sell at a discount in the markets, the hatcheryman will have to get more for his pullet chicks and less for the cockerels. The pricing policy will depend largely on local conditions.

Methods of Sexing.—Most sexing is done by the so-called Japanese method which requires the examination of the vent or cloaca for slight anatomical differences between male and female chicks. In Barred Rocks, however, quite a large number of sexors distinguish by color markings. In Rhode Island Reds, evidence points to quite definite color differentiations, although few commercial sexors use such markings in sexing Reds. In sex-linked crosses, the sex can be identified with high accuracy.

VENT METHOD OF SEXING

The Japanese or Vent Method.—This method was probably first used by the Chinese, but was introduced into this country by Japanese sexors in 1933 and, hence, is usually known as the Japanese method. It consists of examining the vent or cloaca for certain anatomical differences which exist between male and female chicks. Due to the smallness of the vent and the smallness of male eminences, the differences are detectable only by careful examination by expert and experienced sexors or operators.

To become an expert and capable sexor, it is almost a necessity that a person attend a reliable and trustworthy sexing school, where he can learn under capable instructors. He should plan to remain long enough in attendance at one of these schools to become thoroughly grounded in accurately distinguishing the sexes, or he should work for a considerable time under the guidance of an expert sexor.

It is not necessary, of course, to attend a school. Private instruction can be secured. The point we want to make, as so many hatcherymen learned to their sorrow and embarrassment in the early days of sexing, is that sexing is not something a person can learn in a couple of days, or by reading a couple of articles and looking at a few pictures. It is a skill, and like other skills, it requires some time

to acquire. Most sexing schools claim that an apt person can learn to sex quite accurately in two weeks, but speed is acquired only by practice and experience. These schools have also found that some people require a longer period of training than others and that some persons are so constituted that they never can become expert and speedy sexors.

There are several so-called systems in this method. They differ largely in how the chicks are held to examine the vent or cloaca. In all systems, the sexor must look for the same eminences or absence of them. Some sexors use special magnifying glasses, but the majority do not.

Sexing Procedure.—The following description is taken from Canfield (1940 and 1941) in two articles on this subject. There have been several other articles and books published on this subject in much more detail, but we quote merely one here to give the reader a good idea of the subject.



Fig. 91.—Method by which right-handed chick sexor holds chick in left hand. The fecal contents are discharged by pressing gently but sharply on both sides of the abdomen. (*University of Minnesota.*)

The method used in holding the chick in the left hand (for a right-handed person) is shown in Figure 91. Before examining, the fecal contents are discharged by pressing gently but sharply on both sides of the abdomen. Figure 92 shows the way the left thumb and forefinger extend the dorsal surface of the vent upwards, following which the right thumb (with well developed nail) is placed on edge below the ventral portion with the nail on the median line. While the left thumb and right forefinger hold their original positions, but press slightly down, the right thumb nail is pushed upwards



Fig. 92.—This shows how the left thumb and the forefinger are used to expose the vent for examination for the presence or absence of the male organ. See the accompanying description. (*University of Minnesota.*)

everting the ventral portion of the cloaca. To expose more completely, the left thumb and right forefinger are pulled gently sideways. To study difficult specimens the three fingers hold their positions while the mucous membrane in the region of the genital eminence is alternately contracted and expanded by a slight movement of the wrists. In brief, press inward at the sides to make the cloaca stand out. In order to expose the eminence and the folds completely push upwards with the thumb nail at the base of the vent and at the same time pull the vent gently sideways. Figure 93 orients the section studies using the terminology of Forsyth.

Figure 94 shows some of the various male and female types supplied by Canfield (1941). From these it can be seen that there are several variations of the organs in both males and females. Consid-

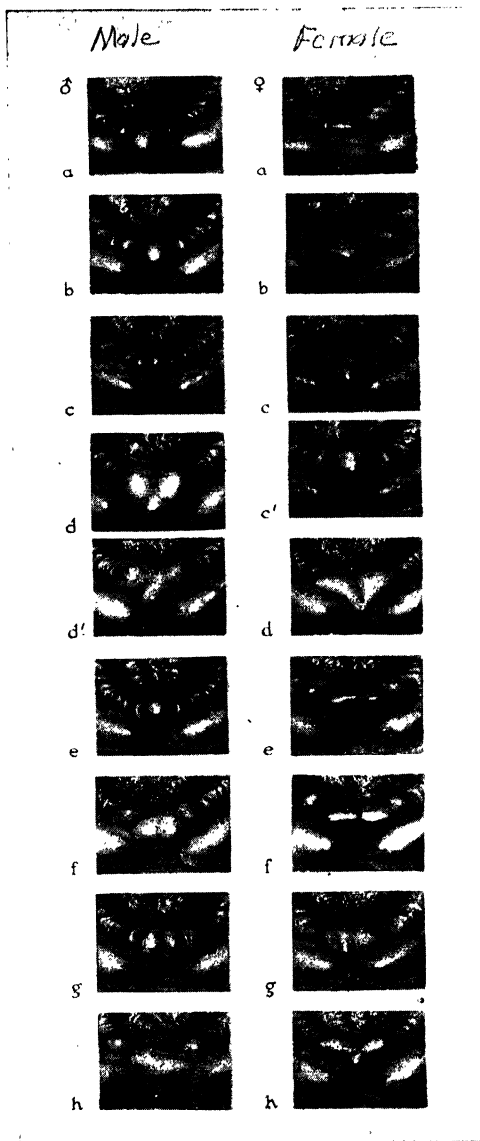


Fig. 94.—Some of the various male and female types as supplied by T. H. Canfield. (*University of Minnesota*.)

hours without sleep and little rest quite obviously is not apt to be as accurate and as speedy as when he starts out. Under such conditions, hatcherymen claim more chicks are apt to be injured in the handling.

Sexing Not Injurious.—There is a perpetual question mark in the minds of hatcherymen as to whether sexing injures chicks. There



Fig. 95.—Chick sexor at work. Note powerful light which he uses.
(*Everybody's Poultry Magazine.*)

can be little doubt that at times and by some sexors under certain conditions of fatigue, some injury may result, but by and large, it appears that little injury is done. Vickers and Davisson (1942) found that reports on the chick mortality from chick customers failed to show any perceptible injury as measured by chick mortality and injury would probably show up in this manner first. Their results are given in Table XXXI. They report as follows:

Quite obviously sexing did not injure these particular chicks because, as will be observed, the mortality was slightly lower than in unsexed chicks. The reason the mortality is slightly lower may be explained in several ways. Possibly the chicks were less crowded in brooders, possibly there was a better selection of chicks before the customers received them, possibly the weaker chicks didn't stand the sexing and were discarded, possibly a better class of farmers and poultrymen secured sexed chicks and did a better job of brooding, and possibly because the difference is so slight, it is merely chance and that another year the figures might show just the opposite. The writers do not know, but we feel rather certain of one thing and that is, sexing does not improve the chicks.

TABLE XXXI.—MORTALITY OF SEXED PULLET CHICKS AS COMPARED TO UNSEXED OR STRAIGHT-RUN CHICKS—1941-42
(Vickers and Davisson—1942)

Breed	Unsexed or Straight-Run Chicks				Sexed Pullet Chicks			
	No. Groups Chicks	No. Chicks Secured	No. Chicks Lost	Per Cent Chicks Lost	No. Groups Chicks	No. Chicks Secured	No. Chicks Lost	Per Cent Chicks Lost
White Leghorns	1,761	542,333	19,562	3.60	355	103,552	3,721	3.59
White Rocks	2,329	602,013	24,973	4.14	59	12,485	296	2.37
Barred Rocks	521	169,712	4,665	2.74	18	6,033	140	2.32
S. C. Reds	108	22,010	1,133	5.14	5	650	13	2.00
White Wyandottes	172	40,604	1,393	3.43	5	725	7	.97
New Hampshires	521	140,819	4,117	2.92	56	12,143	355	2.92
Miscellaneous	938	245,677	10,252	4.17	13	2,559	55	2.15
Totals	6,350	1,763,168	66,095	3.74	511	138,147	4,587	3.32

Note. It is very likely and probable that many of the chicks listed under Unsexed or Straight-Run Chicks were sexed but were not so marked on the cards. In the case of Sexed Pullet Chicks they were so indicated on the cards.

TABLE XXXII.—SEVEN-YEAR COMPARISON OF MORTALITY BETWEEN SEXED AND STRAIGHT-RUN CHICKS IN 322 UTAH FLOCKS COVERING MORE THAN 300,000 CHICKS
(National Poultry Digest, October, 1942)

Year	Straight-Run Chicks	Sexed Pullets
1936	8.5%	11.8%
1937	4.8	5.0
1938	6.1	9.1
1939	8.0	5.4
1940	9.4	4.9
1941	4.6	5.0
1942	5.3	4.2

Chick surveys in other states have shown substantially the same thing. Results of a Utah survey are given in Table XXXII.

Turkeys.—Hammond and Marsden (1937) report that turkey poults can be sexed in a manner similar to chicks. They averaged 97.9 and 93.6 per cent accuracy with four lots of turkey poults reported on. They state:

The genital papillae, which are the basis of determining the sex of the poult, are located in the ventral wall of the vent. In the male poult, there are two firm hemiel-

lipsoidal papillae, one on either side of the midline of the ventral surface of the everted vent. These papillae, in the male, are frequently engorged with blood, which makes them stand out from the surrounding tissues. The papillae in some males are quite small, and may be confused with tiny papillae found in a few females. In some instances, inflamed areas in the vents of females may be mistaken for papillae unless they are observed carefully.

The sex of a turkey can be determined at any age by an examination of its genital papillae.

Ducks and Geese.—Ducks and geese can be easily sexed by the same methods as chicks, although relatively few are sexed.

SEXING BY COLOR MARKINGS OR RATE OF FEATHERING

Purebreds.—Sexing of chicks by means of color markings is limited to a very few breeds. Commercially, it is used mostly with Barred Rocks. Many sexors sex Barred Rocks almost entirely by color markings and find it just as accurate as the vent method.

Barred Rocks.—It has long been known that the size of the light head spots varied in the two sexes, the males tending to have larger spots than the females, but this difference was not accurate enough for commercial use. Other facts have since been discovered, and the sexes can be distinguished more readily by the outline and appearance of the light spots than by size. The male spots tend to be irregular and scattered, while the female spots are more definitely outlined with a tendency to run longer and narrower than the male spots. The female chicks also seem to have darker colored legs.

Using intensity of the black pigment in the down and legs to separate the sexes, Quinn and Knox (1939) secured an accuracy ranging from 83.5 per cent to 91.8 per cent. Commercial sexors, as a result of experience and constant checking, have become more accurate than this. Quinn and Knox (1939) describe the differences observed as follows:

The chief difference between male and female Barred Plymouth chicks consists in the intensity of the black pigment in down color and shank color, the beak pigment being relatively unimportant. Male chicks have silvery gray dorsal down, silvery gray ventral down with two or more white spots, light ashy gray areas between the ventral spots, and yellow shanks. Female chicks have black dorsal down, black ventral down with 1 or 2 white spots; dark ashy gray areas ventrally; and predominantly black shanks. It should be understood, however, that some strains of Barred Plymouth chicks may be more difficult to sex than others, and that considerable variation in down and shank color may exist among male and female chicks of the same strain. The white head spot in male chicks is usually quite irregular in shape, with grayish

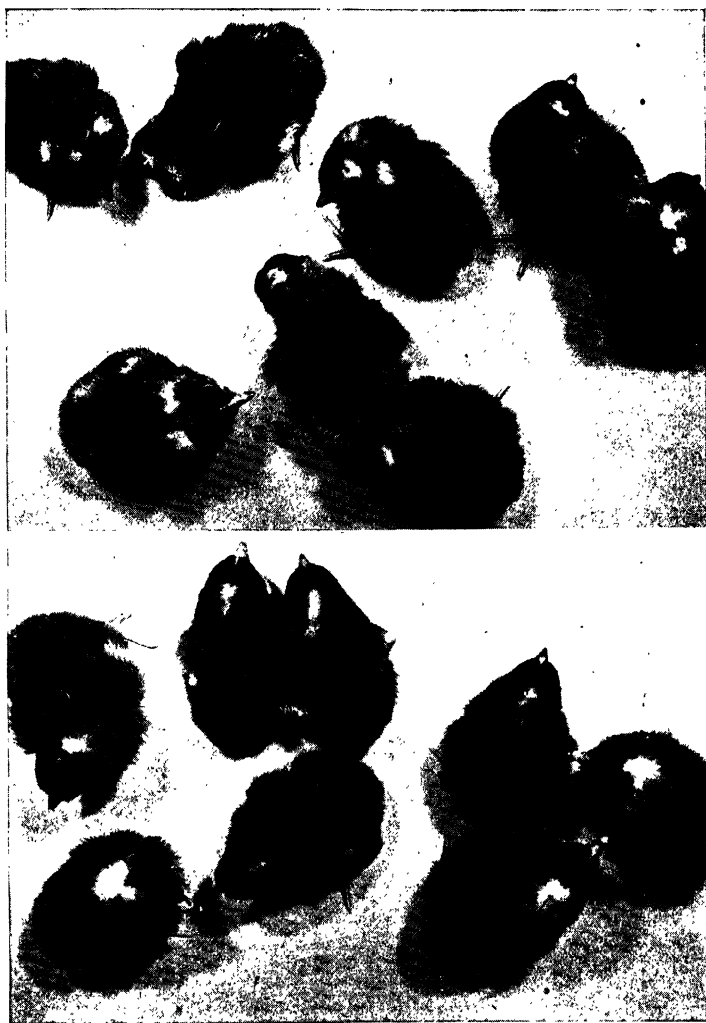


Fig. 96.—Groups of male (top) and female (lower) Barred Plymouth Rock chicks. There is considerable variation in the shape of the head spot in both sexes, but the spot in females is much more regular in outline and compact than in the males. Note that the male head spots are more dispersed and tend to form an indistinct circle extending down on the neck. (*Pub. 718, Department of Agriculture, Dominion of Canada.*)

hairs through the dorsal surface of the head, so that the white spot appears diffused through the black down of the head giving it a more or less silvery appearance. The white spot is usually larger in male chicks.

Female chicks are much darker throughout all black sections of the down, the down being a deep brilliant black.

Silver striping in the dorsal down does not appear to be a reliable index of sex as it appears in both male and female chicks.

Depth or intensity of shank pigment appears to be approximately as accurate an index of sex as down color and may be used with equal confidence even in dusky shanked strains. Usually, chicks with clear yellow shanks are males and chicks with intensely dark or black shanks are females. The male chicks in some strains, however, may have rings or circular bands of dark pigment in the shanks, whereas the female chicks usually have an intense black pigment which may extend to the instep, or below it to the toes, where it usually terminates abruptly.

Beak color appears to be much less reliable . . . than down color or shank color.

Rhode Island Reds.—Byerly and Quinn (1936) report that they were able to sex Rhode Island Red chicks with an accuracy of 82 per cent. Female chicks were marked with spots and stripes of black down on the head or back. Males lacked such markings. Others say pullet chicks have red wing bows with practically no white near shoulders while cockerels show white on wing bows.

Other Breeds.—Quinn and Knox (1940) found that down, shank, and beak color was of little value in distinguishing sex in Jersey Black Giants, Jersey White Giants, and White Plymouth Rocks.

Sex-Linked Inheritance.—Prof. R. C. Punnett of England, in 1919, described the fact that when certain purebred breeds were crossed, the sexes could be determined at hatching time by means of color. This is due to the fact that certain characteristics follow a peculiar type of inheritance, called sex-linked inheritance. Certain characters are transmitted only from dam to son, so that in the case of down color, the sons have the mother's down color, and the daughters, that of the father.

The four well-known characteristics of poultry that exhibit the sex-linked type of inheritance, according to Warren (1942), are (1) gold and silver color, (2) barring and non-barring, (3) slaty and non-slaty shank color, and (4) early and late chick feathering. He offers the following example of sex-linked inheritance.

If a Rhode Island Red male is mated to a Light Brahma female, the female chicks will show various shades of buff or red colored down and the male chicks will be white or smoky white, being very similar to the chicks of standardbred Light Brahmas. This is a case of crisscross inheritance where the daughters show the down color of the father, and the sons that of the mother. As adults, the females are buff or red in color, and the males will be much like pure Light Brahmas. If the cross is made in the oppo-

site direction, using the Light Brahma male, the chicks will all resemble pure Light Brahmas and the sexes cannot be identified at hatching.

Warren (1942) has outlined in Table XXXIII a list of some of the more common breeds that may be used in the various crosses so that chicks may be distinguished at hatching time.

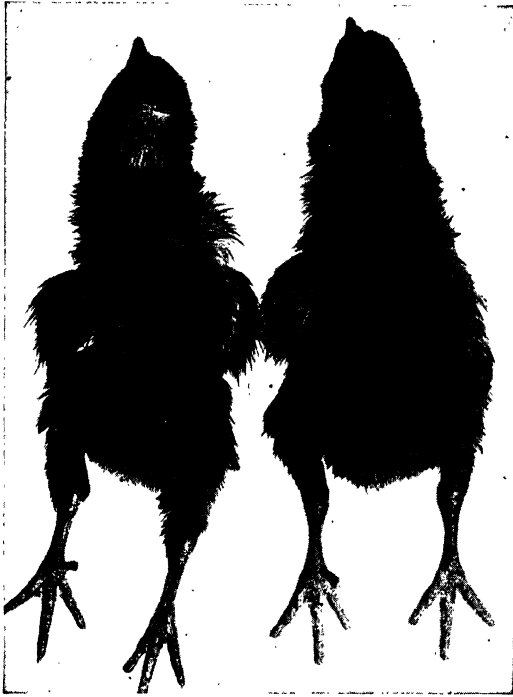


Fig. 97.—Barred-nonbarred method of sex identification in cross of Rhode Island Red male by Barred Plymouth Rock female. Left, male chick showing light head spot. Right, female chick which is entirely black on head and back. (*Kans. Agr. Exp. Sta. Bul. 307.*)

Gold-Silver Cross.—Certain breeds and varieties such as all buffs, partridge and gold laced patterns, and Brown Leghorns and Rhode Island Reds, carry the gold factor, while others, such as all silvers, all Columbians and Light Brahmas, carry the silver factor.

TABLE XXXIII.—A LIST OF SOME OF THE MORE COMMON BREEDS AND VARIETIES THAT MAY BE USED IN THE VARIOUS CROSSES FOR DISTINGUISHING SEX AT HATCHING
(Warren—1942)

Cross		Type of chick	Type of adult
Male	Female		
1. Rhode Island Red	Gold-Silver Cross White Wyandotte Silver Penciled Rock Silver Penciled Wyandotte Silver Laced Wyandotte Columbian Rock Columbian Wyandotte Dark Brahma Light Brahma Columbian Rock Columbian Wyandotte Light Brahma	Females buff or red color. Males cream or white; may show smokiness in down. Both sexes may show narrow striping.	Females buff to red; may show some stippling or striping. Males Columbian pattern.
2. Brown Leghorn Partridge Rock Partridge Wyandotte Golden Laced Wyandotte	Same as No. 1	Same as No. 1	Same as No. 1
3. Blacks	Barred-Nonbarred Cross Barred Plymouth Rock	Females all black above. Male black above except white spot on head.	Females black. Males barred.
4. All other color varieties except White. White Wyandotte may be used.	Barred Plymouth Rock	Same as No. 3	Same as No. 3 except females may show some gold stippling or striping on breast.
5. White Leghorn or most Mediterranean breeds.	Rate-of-Feathering Cross All American, Asiatic, and Orpington breeds	Females have well developed wing feathers at hatching. Males show none or very short feathers.	Difference in feathering not shown in adult.

Note.—Certain European breeds could have been included, but due to their restricted availability, were omitted. Males of the Buff varieties may be substituted for the Rhode Island Red male but the resulting light gold color makes sex identification difficult at times.

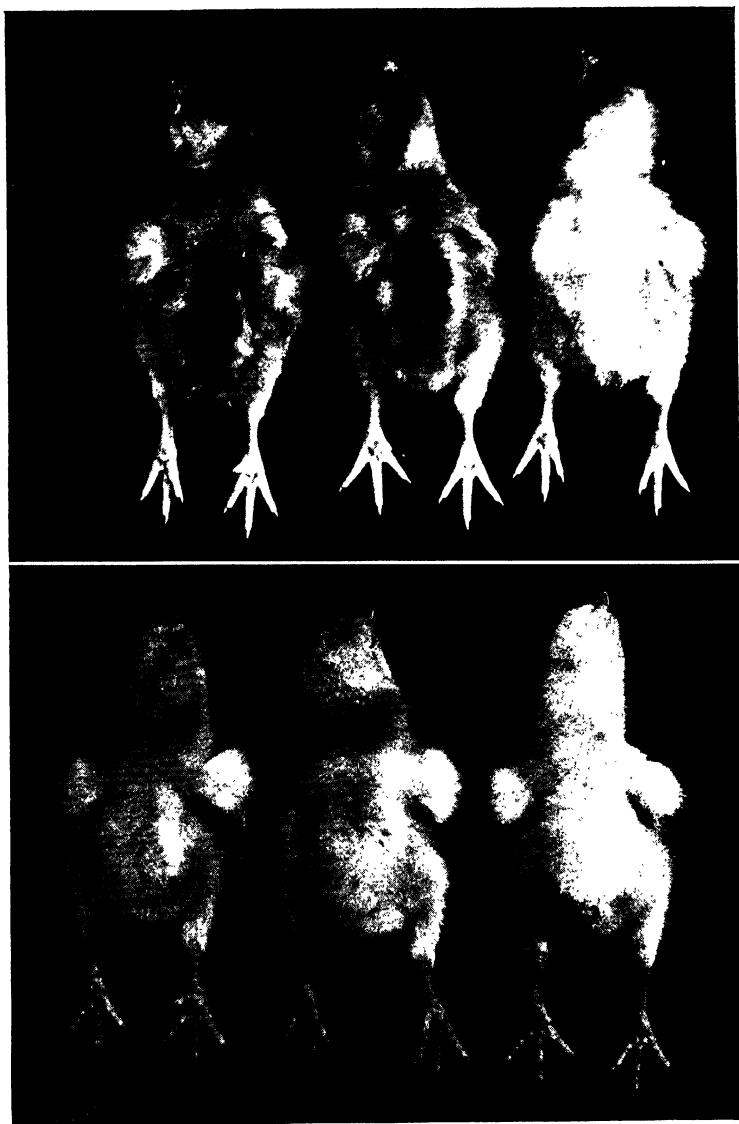


Fig. 98.—Chicks from cross of Rhode Island Red male by White Wyandotte female, showing gold-silver method of sex identification. Upper photo shows female chicks ranging in color from definitely brown striped to light buff. Lower photo shows male chicks with white, yellowish, or smoky down, but never red or buff. (*Kans. Agr. Exp. Sta. Bul. 307.*)

By crossing males from the gold group with females from the silver group, sex at hatching can be determined with a large degree of accuracy. The cockerels will be very light with some dark markings on the head and rump. The pullet chicks will carry the darker brown color, often with dark markings on the head and back. Should the cross be made in reverse, all chicks will show the color of the male, and the chicks cannot be identified at hatching time.

A serious handicap in the use of this cross, if desired for egg production purposes, is the lack of high egg producing strains in silver varieties and breeds. On the male side, however, is the Rhode Island Red and possibly one or two of the others in which egg production qualities are very good in many strains.

Barred-Nonbarred Cross.—The cross which is used more than any other is the barred-nonbarred cross. For example, if Barred Plymouth Rock females are mated to Rhode Island Red males, the female chicks are black or brownish black, while the male chicks are black with a prominent light spot on the head. The adult males will be barred, while the adult females are largely black.

Neither the White Leghorn nor the White Plymouth Rock male can be used for the nonbarred male in this cross, for the offspring of the former will be white, and that of the latter may be largely barred.

Rate of Feathering.—It has been shown that differences in rate of feathering are also inherited in this sex-linked manner. Warren (1942) states that if an early feathering male, such as a White Leghorn, is mated to late feathering females, such as most of the heavy breeds, the daughters will be early feathering, while the sons are late feathering, and they can be distinguished at hatching time by the length of the primary and secondary wing feathers. For greatest accuracy, however, this separation should be done as soon as the chicks are fluffed out. Delay is apt to result in confusion in separating the earliest hatched males from the later hatched pullets.

Since many strains of the popular American breeds have been bred for rapid or early feathering, the cross cannot work if such females are used. The cockerel chicks will then exhibit early feathering, and it will be impossible to distinguish them from the pullet chicks. This situation can be avoided if the flock from which the females will be selected for mating to White Leghorn males is ex-

amed at 10 to 20 days of age, removing all rapid feathering individuals.

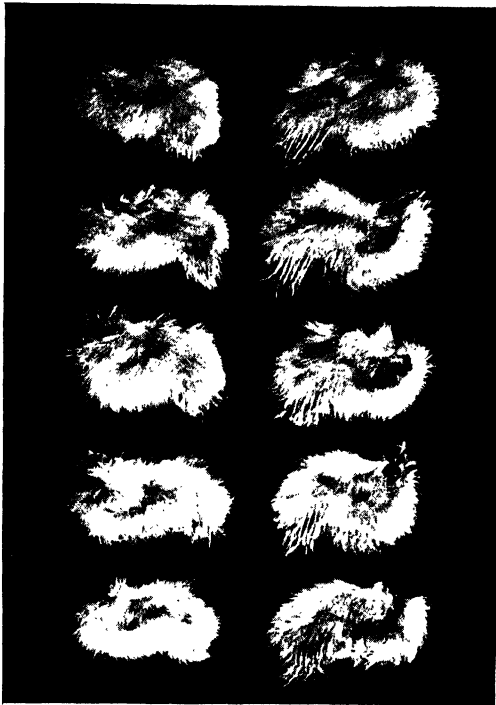


Fig. 99.—Series of wings showing range of flight feather development in day-old chicks from cross of White Leghorn male by Rhode Island Red female. Males are at left and females at right. Similarity of bottom female and top male wings is partially due to the fact that this male hatched several hours earlier than the female. (*Kans. Agr. Exp. Sta. Bul. 307.*)

This method of sex determination has some advantages. It permits the use of White Leghorns in which egg production qualities are developed to the highest degree and are easiest to obtain. The use of Leghorn males means that both sexes will be predominantly white. Pure white flocks are demanded by some poultrymen, and it gets away from the necessity of crossbreeds of dark color which are

objected to and discriminated against in some markets. Most of the crosses with Leghorn males result in white birds with occasional spotting of black, except in the case of Rhode Island Reds when some Red occasionally appears in the surface.



Fig. 100.—Showing difference between sex-linked early and late feathering at the 8- to 14-day age. Note absence of tail in late feathering Rhode Island Red at the right. It has wings one-half to three-fourths the length of the body, while the early feathering White Leghorn chick at the left has wing length equal to or greater than body length. (*Kans. Agr. Exp. Sta. Bul. 307.*)

Early Feathering in Purebreds.—The wing-feathering method of sexing is being used to some extent in sexing purebred chicks. A few hatcheries in this country and in Canada are offering pure strains of rapid and slow feathering chicks for sale so that flocks of each in the same breed can be established and used. This method requires the establishing or development of early and late feathering strains within the breed. The procedure to be followed in establishing early strains is given by Warren (1942) as follows:

The procedure to be followed in developing early feathering strains of the larger breeds is first to examine chicks of the strain when they are from 9 to 12 days old and mark those which have well developed tails, and wings approximately equal to the length of the body. This will be the feathering typical of most White Leghorns. Some strains of the large breeds will have no early feathering chicks. If the early feathering chicks are scarce in a strain, those marked are likely to be females. If both male and female early feathering chicks are found and later mated, their offspring will be pure for early feathering and the strain will breed true for the characteristic thereafter.

If only early feathering female chicks are found they may be mated to a male of their variety in order to obtain early feathering males. Their sons will be late feathering but if these sons are mated to any early feathering females they will produce some males and females which are early feathering.

Poultrymen interested in the production of early feathering strains frequently do not recognize the necessity of examination of the chicks at 9 to 12 days of age. They have too often relied upon one examination made at the broiler stage. Birds showing good feathering at the broiler stage will not necessarily breed true for good feathering. However, if only birds are mated which have well developed tails at the 9- to 12-day age and good feathering at the broiler age, the "bareback" problem will be overcome. After one mating of this type only limited further selection need be made unless new blood is introduced. If new blood is to be brought in it should be done through females and only their female offspring saved. Such female offspring will be pure for early feathering provided their tails are well developed at ten days.

To establish strains pure for slow feathering, the chicks must be gone over at from 10 to 20 days and all the rapid feathering chicks removed so that only slow feathering individuals remain. The females selected for slow feathering must then be mated with males known to be pure for slow feathering, and such males must be progeny tested before it can be known definitely that they are pure for slow feathering.

This is somewhat of a more complicated procedure than the ordinary hatchery is apt to follow and with the sexing services now available, it is a question whether this method will come into general use.

Once the two strains of early and late feathering are established, they must be kept pure. For the sex-linked cross, late feathering females should always be mated with early feathering males, so that the chicks can be identified by wing feather length at hatching time.

Some breeders have established rapid feathering strains of heavy breeds, but do not use them in the sex-linked cross. This is done primarily to be able to offer broiler chicks in which there will be little trouble with late or poor feathering or barebacks.

XV

SOME MANAGEMENT PROBLEMS

Number of Varieties to Hatch.—The number of varieties to hatch will be governed by such factors as size of the hatchery, breed preference in the territory served, type of advertising, and others.

A small hatchery doing a business within a limited area cannot afford to hatch a large number of varieties, because of the difficulty of adjusting settings to the demand for the different varieties. When a large number of varieties is hatched, there is likely to be a considerably larger surplus, after each hatch, of chicks which must be sold as "assorted."

A hatchery depending almost entirely on local sales should be able to concentrate on three or four popular varieties, and not more than a half-dozen at the most. A special report issued by the U. S. Bureau of Agricultural Economics in April 1944 revealed the following breed preferences of chickens raised in 1943:

Breed	Per Cent of Total Raised
Leghorn	33.8
Plymouth Rocks (All Varieties)	25.6
Barred	15.5
White	9.5
New Hampshire	10.0
Rhode Island Red	5.5
White Wyandotte	1.8
Orpington	1.2
Cross Breeds	9.4
Mixed	11.4
All others	1.3
	100.0

Breed preference may vary from year to year, depending upon the profitableness of eggs or poultry meat. When broiler prices are good, there is usually an increase in the proportion of heavy breed chicks raised.

While Leghorns comprised 33.8 per cent of all chickens raised in 1943 and were the predominant breed, they comprised 37 per cent of all chickens raised in 1930. Plymouth Rocks, on the other hand, increased from 17.3 per cent in 1930 to 25.6 per cent of all chickens raised in 1943.

Popularity of breeds differs greatly by areas. California, Wisconsin, Washington, Oregon, Utah, Texas, Minnesota, Nevada, and New Jersey are strong Leghorn states. In California, 68 per cent of the chickens raised in 1943 were Leghorns. About 52 per cent of the chickens raised in the Pacific Coast States in 1943 were Leghorns, while 24.5 per cent were New Hampshires.

In the New England states, on the other hand, 65 per cent of the chickens raised in 1943 were heavy breeds, 2 per cent light breeds, 30 per cent cross breeds, and 3 per cent mixed breeds. Rhode Island Reds comprised 49 per cent of the chickens in Massachusetts. Cross breeds comprised 49 per cent of the chickens in Delaware, center of commercial broiler growing.

Because it is difficult to get high producing strains in many of rarer breeds and varieties, poultry raisers seem to have lost interest in them. Hatchability and fertility are often poor in these rare breeds, resulting in higher production costs. Occasionally, a hatcheryman may be able successfully to promote one of the less popular breeds, but it may involve considerable advertising expense until he has established the worth of his strain.

Some hatcheries doing an extensive mail order business find it desirable to have a fairly large number of varieties, believing that their advertising will appeal to a larger number of farm and poultry publication readers than when they have only one breed to offer. Theoretically, this should mean lower inquiry costs, but some of the most outstanding hatchery successes have been made by single breed hatcheries, notably with White Leghorns and New Hampshires.

Length of Hatching Season.—Under normal conditions, most hatcheries will produce from two-thirds to three-fourths of their annual output of chicks during March, April, and May. These are the months when most farm chicks are started, and April is usually the peak month.

Hatcheries supplying chicks to commercial egg farmers who do year 'round brooding and to broiler growers may operate every

month of the year except during the few weeks prior to the Christmas holiday season when shipment of chicks may be hazardous because of congested mail and express facilities. If the volume of off-season chicks produced is substantial, it will increase the number of chicks hatched per unit of egg capacity and spread the overhead expense over a larger number of chicks.

Bennett and Moore (1941) reported that during the last six months of 1940, New England hatcheries produced 31.8 per cent of the chick output for the year, while hatcheries in the East North Central states produced only 7.5 per cent of their year's output in the last half of the year. New England's off-season production of chicks is due largely to the demand from broiler growers.

TABLE XXXIV.—PERCENTAGE OF ANNUAL OUTPUT OF CHICKS PRODUCED EACH MONTH BY HATCHERIES IN THE UNITED STATES¹

	1933	1939	1940	1941	1942	1943	1944	1945
January	3.8	4.5	3.7	4.0	4.1	3.9	3.9	3.3
February	9.0	9.4	6.4	8.5	8.2	8.5	10.0	6.9
March	20.4	20.3	19.9	18.5	20.4	19.4	22.8	16.8
April	27.2	26.5	28.4	22.6	24.1	22.1	24.7	21.7
May	21.8	21.9	21.5	21.1	20.3	21.1	18.6	19.5
June	7.7	7.8	9.3	12.4	10.2	13.3	5.8	11.5
July	2.2	2.1	2.6	2.8	2.5	3.1	2.8	6.3
August	1.2	1.5	1.5	1.8	1.9	2.0	2.0	3.8
September	1.5	1.6	1.6	1.8	1.8	1.7	1.9	2.9
October	1.6	1.5	1.6	1.9	1.9	1.8	2.2	2.6
November	1.7	1.4	1.6	2.2	2.1	1.6	2.4	2.5
December	1.9	1.5	1.9	2.4	2.5	1.5	2.9	2.2
Total	100	100	100	100	100	100	100	100

¹ Figures from U. S. Bureau of Agricultural Economics.

Due mainly to the expansion of commercial broiler production, the proportion of the year's output of chicks hatched during the last half of the year showed a substantial increase between 1930 and 1945, according to figures reported by the U. S. Department of Agriculture in "The Poultry and Egg Situation" for December 1945. In 1930, only 4.3 per cent of the annual chick output occurred in the last six months of the year. By 1945, however, it had increased to 20 per cent.

Except where there is an unusually high demand for early-hatched chicks, hatcheries catering to the farm-flock trade may not find early

chick sales profitable because of the relatively small volume of business. On the other hand, hatcheries conducting a feed and poultry supply business may find it advisable to produce early chicks and out-of-season chicks as a matter of service to their customers and also to maintain steady employment of skilled help.

Extension of the hatching season into late June or July may increase the utilization of the incubator capacity, but unless the chicks go to commercial egg farmers or to broiler growers who are experienced in out-of-season brooding, complaints of higher chick mortality may come from farmers who have not mastered summer brooding. Reports of heavy chick losses in summer, even though no fault of his own, may reflect upon the reputation of the hatcheryman.

Surplus Chicks.—A surplus of chicks for which there are no immediate buyers is one of the most difficult problems confronting many hatcherymen. Losses sustained in selling surplus chicks at distress prices can be quite costly. Except for a sudden cancellation due to unexpected changes in the poultry outlook, avoidance of a surplus is largely within a hatcheryman's own control.

Some hatcherymen, when confronted with a surplus, dispose of their chicks at prices below cost of production. This may take the form of a chick auction, the peddling of chicks from farm to farm by truck, advertisements in papers, special cards, folders, etc., but it all amounts to dumping. There are instances where the average price received by these methods are as low as 2 cents a chick. How long can a hatcheryman hope to survive when his actual cost of producing and selling a chick runs between 8 and 9 cents?

The psychological effort of disposing of chicks at extremely low prices is bad also. When farmers discover that a hatchery is practically giving away chicks at certain seasons of the year, they may hold back on placing their chick orders until it becomes absolutely necessary.

When a surplus does occur, there are a number of courses for a hatcheryman to pursue:

1. Sell chicks to a hatchery which is short. Various hatchery organizations offer a service which is known as the "long and short bulletin." Members of these associations are privileged to list their

surplus chicks as well as their needs in case they are short of chicks to fill orders for the current week.

2. Dispose of the chicks through wholesale outlets. Many hatcheries maintain wholesale outlets along with their retail business primarily for this purpose, but when the hatchery has difficulty selling its chicks, wholesale buyers are likely to be experiencing the same trouble; so this method of handling a surplus may have little value.

3. Place the chicks in battery brooders and grow them out to be sold as started chicks. Since the development of the battery brooder in the late twenties, this method of handling surpluses has become widespread, and many hatcheries have battery brooders even though they seldom have occasion to use them.

4. Place chicks out on farms to be grown on a share plan or agreement until they are about $4\frac{1}{2}$ to $5\frac{1}{2}$ months of age when they can be sold as "ready-to-lay" stock, depending upon the breed or variety. This plan can be used in an area where there seems to be a demand for pullets of almost laying age. One of the financing plans described in Chapter XIX could be followed, the hatcheryman retaining title to the chicks until the pullets and also the cockerels are sold.

A Maryland hatcheryman used a novel method of disposing of his surplus chicks. If a customer happened to have rather poor luck with one lot of chicks, this hatcheryman approached the customer the very first time he had a surplus of chicks available and offered a second lot at a rather attractive discount. Not only did he take care of his surplus, but he pleased the customer and made friends of other folks who bought his chicks at regular prices.

Avoiding a Surplus.—The only sound way to avoid a surplus is to adjust settings to the number of orders on hand, allowing some overrun to take care of sales to folks who do not order in advance.

In the late twenties, Indiana hatcheries pledged themselves to set eggs according to the actual orders on hand, plus 10 per cent, up until the March 15th setting, based on a 50 per cent hatch. With the progress that has been made in improving hatchability since that time, it would probably be advisable now to base calculations on a 60 per cent hatch or even higher.

From the standpoint of sound business methods, it is to the advantage of the hatcheryman to base his settings on a plan such as

this, rather than gamble on finding buyers for the chicks when the hatch is taken off. Even though he may be unable to fill some orders, he will still be ahead on a reduced production schedule if the chicks that are produced are sold at a profit, for the losses sustained on the sale of surplus chicks may eliminate the profit on a much larger quantity of chicks sold at the regular prices.

Once a hatcheryman resorts to price-cutting in order to move surplus chicks, it becomes difficult for him to develop his business on the basis of advance orders so that hatches can be planned, for customers will be inclined to hold off on ordering if they think a drop in price is likely to occur.

Hatcherymen in some sections covering a number of counties make a practice of getting together at regular intervals to discuss common problems and the general outlook. Through this type of friendly cooperation, they are able better to determine their settings and avoid surplus chicks and the resulting price cutting.

TABLE XXXIV(A).—BREED DISTRIBUTION IN NATIONAL POULTRY IMPROVEMENT PLAN HATCHERY SUPPLY FLOCKS, 1941-42—1944-45

Year	New Hampshire %	White Leghorn %	White Rock %	Barred Rock %	Rhode Island Red %	White Wyandotte %	Cross Bred %	Others %
1941-42	21.1	25.0	15.9	11.4	3.3	3.3	2.0	5.4
1942-43	24.0	27.0	16.3	14.1	8.9	2.6	2.8	4.3
1943-44	25.2	26.3	16.5	12.2	8.4	2.2	5.3	3.8
1944-45	29.6	24.8	14.7	11.1	9.0	1.7	6.5	2.6

TABLE XXXIV(B).—BREED DISTRIBUTION IN HATCHERY SUPPLY FLOCKS OHIO POULTRY IMPROVEMENT ASSOCIATION MEMBERS, 1941-42—1945-46

Year	New Hampshire %	White Leghorn %	White Rock %	Barred Rock %	Rhode Island Red %	White Wyandotte %	Cross Bred %	Others %
1941-42	4.0	37.5	28.9	14.1	3.4	3.8	—	8.3
1942-43	6.6	37.5	28.5	13.6	3.4	3.5	1.8	5.1
1943-44	9.9	34.8	29.2	13.1	3.2	3.2	2.4	4.3
1944-45	14.0	31.7	29.7	12.3	3.3	3.1	2.5	3.4
1945-46	19.5	28.4	28.7	11.5	3.2	2.7	3.0	3.0

CHICK PRICES AND HATCHERY COSTS

WHEN THE HATCHERY industry was in the earlier stages of its development, competition was not a serious problem, and the prices obtained for chicks often represented a clear profit of 100 per cent over all costs of production. Under such favorable conditions, the matter of cutting the corners to keep down costs did not worry the average hatcheryman.

As more hatcheries were established and competition grew keener, efforts of hatcheries to outdo one another in their appeals to chick buyers resulted in a lowering of prices, which, of course, meant that the margin of profit was considerably narrowed and, in some cases, entirely eliminated. For this reason, price is one of the most important problems confronting the hatchery operator, and the mistakes which have been made in pricing baby chicks have probably helped to put more hatcheries out of business than any other one factor.

What Is a Fair Price for Chicks?—Many attempts have been made to answer this question. It could be answered by saying that the price should equal the cost of production plus a reasonable profit to the hatcheryman for his work. Some have maintained that this profit should be equal to one-third of the selling price of the chicks, but under normal competitive conditions, it is likely to average less.

Warren and Wermel (1935) found that 683 hatcheries surveyed had an average profit of \$1.31 for each 100 chicks sold during the 1934 season, or 15.7 per cent of the selling price. The profit ranged from 95 cents per 100 chicks sold by large hatcheries to \$2.23 for hatcheries under 10,000-egg capacity. The average selling price was \$8.33 per 100 chicks.

A survey of 110 Maryland hatcheries by Poffenberger and DeVault (1939) revealed an average profit of \$1.72 per 100 chicks hatched during the 1936-37 season; \$1.96 for the 1937-38 season;

and \$1.84 for the two seasons combined. The average selling price for the two seasons was \$8.81 per 100 chicks.

Naturally, prices will vary with economic conditions. The war stimulated demand in 1943 caused chick prices to rise more than usual, for there were not enough chicks to meet the demand. The average United States price for 100 chicks that year was \$13.86, ranging from \$12.98 in the South Central states to \$17.65 in the Pacific Coast states. As egg-feed and poultry meat-feed ratios become less favorable, prices tend to go downward because of the competition to secure the chick business that is available.

If the chick output goes to jobbers and other wholesale outlets, prices can be somewhat below the retail prices because of the reduced selling expense when disposing of chicks on a large scale.

The breeder-hatcheryman who does considerable trapnesting and pedigree work will, on the other hand, have much higher production costs, consequently, his prices must of necessity be much higher than those of the wholesaler or the hatcheryman producing just ordinary chicks. To get this higher price, which he must have to make a profit, will depend largely on his skill as a merchandiser.

Complete Cost Records Necessary.—Because knowledge of production costs is so essential in determining the prices that the chicks should bring, complete cost records are necessary in the operation of a hatchery.

In all too many instances, however, records kept by hatcheries are entirely inadequate. Many hatcherymen fail to take into account such items as rent and depreciation, and overlook the charge for their own labor or that of their family. Continued sale of chicks below cost of production cannot help but lead to financial distress and eventual bankruptcy.

DISTRIBUTION OF COSTS

Hooper (1932) found that the average expense of producing 100 chicks in nine Ohio hatcheries was \$9.18, ranging from \$8.85 to \$10.76. The average cost of producing 100 chicks in 1934 by the 683 hatcheries surveyed by Warren and Wermel (1935) was \$7.02. Poffenberger and DeVault's (1939) study of 110 Maryland hatcheries indicated an average cost of \$6.97 per each 100 chicks hatched

in the 1936-38 period, ranging from \$6.25 per 100 chicks for the most profitable group of hatcheries to \$9.32 for the least profitable group.

In the Maryland study, chick production costs were distributed as follows:

	Average Per 100 Chicks Hatched	Per Cent of Total
Cost of eggs	\$4.44	63.7
General expenses	.22	3.2
Hatchery overhead	.72	10.3
Labor	.68	9.7
Selling cost	.30	4.4
Cost of containers	.13	1.9
Allowances	.29	4.1
Cost of breed improvement	.06	.8
Cost of custom hatching	.13	1.9
Total	\$6.97	100.0

A more detailed analysis of these items of cost per hatchery and for each 100 chicks produced appears in Table XXXV.

Chick production costs can be grouped as direct production costs, indirect production costs, and selling and administrative costs.

Direct Production Costs.—Hatching eggs and labor are the main direct production costs. Quite frequently, small family-operated hatcheries fail to make any charge for the work performed by members of the family.

Hooper (1932) found that the egg cost averaged \$4.65 for each 100 chicks produced, while the labor cost was 91 cents for each 100 chicks, averaging somewhat higher for hatcheries with a small output.

Warren and Wermel (1935) reported an egg cost of \$3.55 for each 100 chicks hatched by the 683 hatcheries surveyed in 1934. This was equal to 50.6 per cent of the average total cost of producing 100 chicks. Egg costs, however, ranged from \$2.55 per 100 chicks in the south central states to \$5.14 per 100 chicks in New York and the New England states. Labor costs averaged \$1.29 for each 100 chicks.

The 110 Maryland hatcheries studied by Poffenberger and DeVault (1939) had an average egg cost of \$4.44 for each 100 chicks hatched, while labor averaged only 68 cents.

Indirect Production Costs.—Indirect expenses include those costs resulting from the operation of the incubators and the occupancy of the building. It includes such items as heat, light, power and water; supplies and sundry hatchery expenses; repairs, taxes, insurance on fixtures and equipment; rent or equivalent building expense; depreciation on fixtures and equipment; automobile expense; and legbands and flock memberships.

The most serious error usually made in computing the indirect production costs is to allow too little depreciation on hatchery equipment, especially on incubators. Some hatcherymen allow as little as 5 per cent depreciation on their incubators, a figure entirely too low when we consider the fact that new improvements in incubators sometimes make it necessary to replace old machines relatively early. Yearly depreciation charges should be calculated as follows: 10 per cent on incubators, 20 per cent on other hatchery equipment, 10 per cent on office equipment, and 20 per cent on automobiles and trucks.

Again, many operators fail to arrive at accurate cost figures by not figuring any rental for the building, simply because they own the building and perhaps are using it for other purposes. Even though no rental is being paid on the building used for the hatchery, a minimum charge equal to 5 or 6 per cent of the value of the building, or that portion used for the hatchery, plus taxes and insurance on the building, should be used in place of rent.

Selling and Administrative Costs.—Salaries of office workers and field representatives, advertising, telephone, telegraph, office supplies and expense, chick replacements, association dues, flock improvement, depreciation on office furniture and fixtures, and bad debts are among the items that should be included in selling and administrative expenses.

Lowrie (1930) found that the selling and administrative costs averaged \$1.16 per 100 chicks, while Hooper (1932) reported an average of \$2.57 for each 100 chicks. Poffenberger and DeVault (1939) did not group the selling and administrative costs in this manner. Advertising, telephone and telegraph, truck transportation, parcel post and express, stamps, stationary, and miscellaneous expenses, however, were only 30 cents for each 100 chicks. Much depends upon the nature of the hatchery business, whether it is

HATCHERY MANAGEMENT

TABLE XXXV.—COSTS AND PROFITS OF 110 MARYLAND HATCHERIES, 1936-38. AVERAGE
(Poffenberger and DeVault—1939)

Item	Average per Hatchery			Average per 100 Chicks Hatched		
	All Hatcheries	Eastern Shore Hatcheries	Western Shore Hatcheries	All Hatcheries	Eastern Shore Hatcheries	Western Shore Hatcheries
Number of hatcheries.....	110	29	81	110	29	81
Number of chicks hatched.....	109,392	230,973	50,481	111,921	66,981	44,940
Number of chicks custom hatched.....	7,536	12,364	5,808	8,289	3,585	4,704
Per cent of hatchability.....	71.6	72.2	70.8	71.6	72.2	70.8
Total hatchery investment.....	\$5,284.56	\$8,536.22	\$4,070.40	\$5.23	\$3.70	\$7.61
Hatchery investment as per cent of total investment	38.4	68.4	29.0	38.4	68.4	29.0
Income:						
Value of pullorum-tested chicks sold.....	\$7,790.82	\$17,896.38	\$4,172.78	\$7.62	\$7.72	\$7.47
Value of non-pullorum-tested chicks sold.....	527.52	1,327.20	241.21	.55	.61	.46
Value of chicks kept.....	394.16	416.92	386.01	.40	.18	.73
Income from custom hatching.....	248.18	441.96	178.80	.24	.18	.32
Total	\$8,960.68	\$20,082.46	\$4,978.80	\$8.81	\$8.69	\$8.98
Costs:						
General expenses:						
Fuel	\$177.82	\$316.07	\$128.17	\$0.18	\$0.14	\$0.24
Light, water, disinfectants and misc.....	48.04	70.14	40.18	.04	.03	.06
Total	\$225.86	\$386.21	\$168.35	\$0.22	\$0.17	\$0.30
Hatchery overhead:						
Taxes	\$ 60.83	\$ 82.18	\$ 52.96	\$0.06	\$0.04	\$0.10
Insurance	27.98	57.96	17.26	.03	.02	.04

CHICK PRICES AND HATCHERY COSTS

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Depreciation	393.80	685.00	289.18	.38	.30	.53
Interest on investment	241.22	392.44	186.67	.24	.18	.34
Office supplies, fees, misc.	7.68	10.12	6.78	.01	..	.01
Total	\$731.51	\$1,227.70	\$552.85	\$0.72	\$0.54	\$1.02
Labor						
Hired	\$254.34	\$591.14	\$134.16	\$0.25	\$0.25	\$0.24
Family	432.98	702.72	336.08	.43	.31	.62
Total	\$687.32	\$1,293.86	\$470.24	\$0.68	\$0.56	\$0.86
Selling Cost:						
Advertising	\$116.12	\$230.66	\$ 75.11	\$0.11	\$0.10	\$0.14
Telephone and telegraph	30.82	53.34	22.76	.03	.02	.04
Transportation (truck)	87.94	176.88	56.10	.09	.08	.10
Express (parcels post)	43.18	109.76	19.34	.04	.05	.04
Stamps, stationery and misc.	29.26	73.22	13.50	.03	.03	.02
Total	\$307.32	\$643.86	\$186.81	\$0.30	\$0.28	\$0.34
Allowances:						
Value of extras	\$195.88	\$394.71	\$124.70	\$0.19	\$0.18	\$0.22
Replacements	41.62	98.02	21.43	.04	.04	.04
Bad debts	52.06	139.88	20.60	.05	.06	.04
Total	\$289.56	\$632.61	\$166.74	\$0.29	\$0.28	\$0.30
Cost of eggs	\$4,508.07	\$11,046.71	\$2,170.08	\$4.44	\$4.78	\$3.92
Cost of containers	\$ 132.52	\$ 240.85	\$ 75.84	\$0.13	\$0.10	\$0.14
Cost of breed improvement	\$ 58.21	\$ 123.55	\$ 34.82	\$0.06	\$0.06	\$0.07
Cost of custom-hatching	\$ 132.42	\$ 156.22	\$ 124.92	\$0.13	\$0.07	\$0.23
Total hatchery cost	\$7,072.79	\$15,751.57	\$3,950.65	\$6.97	\$6.84	\$7.18
Total net profit or loss	\$1,887.89	\$ 4,330.89	\$1,028.15	\$1.84	\$1.85	\$1.80
Per cent return on investment	35.5	50.2	24.7	35.5	50.1	24.7

selling its chicks locally or by mail. The Maryland hatcheries appeared to be doing largely a local business.

FACTORS AFFECTING PROFITS

Poffenberger and DeVault (1939) declared that hatchery profits were influenced by (1) gross income and cost, (2) efficiency in the use of fuel, (3) efficiency in the use of labor, (4) investment, (5) egg cost, (6) hatchability of eggs, (7) source from which eggs were obtained for hatching, (8) premium paid for eggs, (9) number of chicks hatched, (10) hatchery capacity and capacity utilized, (11) selling cost, (12) cost of allowances, (13) length of the hatchery operation, and (14) marketing practices.

The following observations are quoted, in part, from the study of 110 Maryland hatcheries made by Poffenberger and DeVault (1939) for the two-year period, 1936-38:

Gross Income and Cost.—Both gross income and cost per hatchery in the most profitable group averaged much larger than in the least profitable group. The most profitable hatcheries showed a profit of \$3,635.85 per hatchery and the least profitable hatcheries showed a loss of \$307.02 per hatchery, the profit for all hatcheries averaging \$1,887.89.

The most profitable hatcheries hatched 120,033 chicks per hatchery, more than four times as many as the least profitable hatcheries. The average for all hatcheries was 116,928 chicks.

Gross income per 100 chicks hatched for the most profitable hatcheries was larger than for the least profitable hatcheries, and the cost was lower. The most profitable hatcheries had an average gross income of \$9.47 per 100 chicks hatched, an average cost of \$6.25 per 100 chicks hatched, and an average profit of \$3.22 per 100 chicks hatched, as compared with an income of \$8.30, a cost of \$9.32 and a loss of \$1.02 per 100 chicks hatched for the least profitable hatcheries. All hatcheries studied showed an average income of \$8.81 per 100 chicks hatched, an average cost of \$6.97, and an average profit of \$1.84 per 100 chicks hatched for the two-year period.

Fuel Cost.—As the cost of fuel per 1,000 chicks hatched increased, profit decreased. An average profit of \$2.10 per 100 chicks hatched was made by the hatcheries having a fuel cost of \$1.49 and under per 1,000 chicks hatched. Profit per 100 chicks hatched decreased as the fuel cost increased and when the fuel cost exceeded \$4.50 per 1,000 chicks hatched, a loss was sustained.

The number of chicks hatched per hatchery increased inversely with the fuel cost. Hatcheries having a fuel cost of \$1.49 and under per 1,000 chicks hatched, hatched 315,214 chicks per hatchery, whereas, hatcheries with a fuel cost of \$6 and over per 1,000 chicks hatched, hatched only 17,488 chicks per hatchery.

Fuel cost per 100 chicks hatched averaged 14 cents for the most profitable hatcheries; 35 cents, for the least profitable; and 18 cents as the average of all hatcheries studied.

Labor Cost.—The new improvements in incubators have simplified many of the labor problems. Less labor is required to operate new incubators than old ones of the same capacity and less skilled labor may possibly operate the new machines more efficiently than skilled labor operated the old type machines.

The greatest problem with labor is to operate a hatchery of such a capacity as to utilize the labor to the maximum of efficiency and output per unit of labor input.

The number of chicks probably has a direct influence on the cost of labor per given unit. As the cost of labor per 1,000 chicks hatched increased, the number of chicks hatched per hatchery decreased from 232,853 chicks for the lowest labor cost group to 39,230 for the highest labor cost group.

The highest average profit, \$2.26 per 100 chicks hatched, was made by the group of hatcheries with a labor cost of \$4.99 and under per 1,000 chicks hatched. A larger average profit per 100 chicks was realized by the group of hatcheries with a labor cost from \$9 to \$12.99 per 1,000 chicks hatched than the group with a labor cost from \$5 to \$8.99 per 1,000 chicks hatched. This may be accounted for by the fact that the average number of chicks hatched by the latter group was such that the labor was not used as economically as possible or to the maximum of efficiency. When the labor cost exceeded \$13 per 1,000 chicks hatched, a loss was sustained.

Labor cost per 100 chicks hatched averaged 46 cents for the most profitable hatcheries; \$1.53 for the least profitable hatcheries; and 68 cents for all hatcheries studied.

Capital Investment.—Many hatcheries are equipped with modern incubators which require only a small building but are capable of hatching more chicks than older and obsolete incubators which require a larger housing space. The more the hatching capacity is utilized, the smaller the investment per chick hatched. Some hatcheries are operated the entire year and almost to capacity, thereby making the maximum use of investment, whereas other hatcheries are operated only a few months and at no time utilize the incubators to full capacity.

The most profitable hatcheries had an average investment of \$4.30 per 100 chicks hatched; the least profitable hatcheries, \$15.82; and all hatcheries, \$5.02 per 100 chicks hatched.

Egg Cost.—Egg cost made up about 64 per cent of the total cost of producing day-old baby chicks. The cost of eggs varies according to the current price, the premium and hatchability. Since egg cost is one of the most variable cost factors in the hatchery industry, it will probably effect profits more than any other factor unless the selling price of chicks fluctuates with the price of eggs.

As the egg cost per 100 chicks hatched increased, the average number of chicks hatched per hatchery, gross income and cost per hatchery increased. The largest profit was made by that group of hatcheries which had an egg cost of \$2.99 or less per 100 chicks hatched. Profit decreased as egg cost increased to the \$3.50 to \$3.99 range per 100 chicks hatched and then increased as the egg cost increased.

Hatchability.—All hatcherymen strive to obtain the highest hatchability possible because of the direct relationship of profit to the number of chicks hatched for a given number of eggs set. Hatchability may be influenced by several factors: (1) Percentage of fertile eggs incubated; (2) handling and care of eggs from the time they are laid until they are set; (3) grading of eggs before incubation; (4) operation of the incubator; and (5) care of the eggs in the incubator.

Frequently, hatcherymen pay their flock owners a premium for their eggs on the basis of hatchability. This necessarily requires more bookkeeping, but it is believed by those who have tried this system that it is well worth the extra time and labor.

This study shows a direct relationship between hatchability and profit. As the per cent of hatchability increased, profit increased. When the hatchability dropped below 65 per cent, a profit of only 30 cents per 100 chicks was made, whereas a profit of over \$2.23 per 100 chicks hatched was made when the hatchability exceeded 75 per cent. The number of chicks hatched per hatchery increased as the per cent of hatchability increased to 75 per cent and then decreased.

The average hatchability for the most profitable hatcheries was 72.6 per cent; the least profitable, 67.2 per cent; and the average of all hatcheries, 71.6 per cent.

Source of Hatching Eggs.—Eggs incubated by Maryland hatcherymen may be classified according to the source, as follows: Eggs obtained from officially pullorum-tested flocks, unofficially pullorum-tested flocks and non-pullorum-tested flocks.

For the year 1936-37, officially pullorum-tested eggs amounted to 67.9 per cent of the total eggs incubated; unofficially pullorum-tested eggs, 21.7 per cent; and non-pullorum-tested eggs, 10.4 per cent of the total. Hatchability of the three classes of eggs was 70.3 per cent, 71.6 per cent and 77.5 per cent, respectively. The price of the three classes was 37.7, 30.8 and 32 cents per dozen, respectively. The average hatchability for all eggs incubated was 71.3 per cent and the average price was 33.5 cents per dozen for the year 1936-37.

The average profit per 100 chicks hatched was 23 cents higher for hatcheries which incubated eggs from pullorum-tested flocks than for those hatcheries which did not incubate eggs from pullorum-tested flocks. The average profit per 100 chicks hatched was 56 cents higher for hatcheries which officially pullorum-tested than for those which unofficially pullorum-tested.

Premium Paid for Eggs.—A premium is paid for eggs as an incentive for flock owners to follow a definite breed improvement program and to produce high quality eggs for hatching purposes. Many poultrymen who regularly produce eggs for hatcheries usually have a contract or an agreement with a certain hatchery operator either written or otherwise in order that they may be assured of an outlet for their quality eggs at a premium price.

Premiums paid by Maryland hatchery operators vary from nothing to 20 cents per dozen and sometimes higher for a particular breed or strain of chicks. About 43 of the 110 hatcheries paid no premium for the eggs which they bought; this group, however, includes hatcherymen who hatched eggs from their own flocks for which no premium was recorded, but, in many instances, the price allowed by the hatcherymen for his eggs was high enough to account for a fair premium. Nineteen hatcheries paid an average premium of 6.3 cents per dozen; 32 hatcheries, 10 cents; and 16 hatcheries paid an average premium of 14.8 cents per dozen for eggs purchased.

The average number of eggs upon which premiums were paid increased as the rate of premium increased. Likewise, the selling price of chicks and profit increased as the rate of premium paid per dozen of eggs purchased increased. This study indicates that the highest selling price of \$9.24 per 100 chicks and the largest profit of \$2.28 per 100 chicks sold were obtained by the group of hatcheries paying a premium of more than 10 cents, or an average of 14.8 cents per dozen for eggs purchased.

Income, cost, and profit per hatchery increased as the number of chicks hatched increased. The lowest group, hatching less than 10,000 chicks per year, sustained a loss of 88 cents per 100 chicks hatched; and the highest group, hatching over 80,000 chicks per year, earned a profit of \$1.82 per 100 chicks hatched. The profit per 100 chicks hatched for the group of hatcheries hatching from 40,000 to 80,000 chicks was slightly less than for the group hatching from 20,000 to 40,000 chicks, which might have been caused by an uneconomical labor unit requirement; that is, too much labor required for a one-man unit and not enough for the maximum and efficient use of a two-man unit.

Hatchery Capacity.—Hatchery capacity influences the number of chicks hatched per hatchery and the income, cost and profit. About 30 per cent of the hatcheries studied in Maryland had a hatchery capacity of less than 10,000 egg units; about 12 per cent from 40,000 to 80,000 egg units; and about 12 per cent, in excess of 80,000 egg units. The number of chicks hatched, except the hatcheries with a capacity of from 10,000 to 20,000 which were slightly less than for those hatcheries with a capacity less than 10,000, increased as the egg capacity per hatchery increased.

A profit of \$1.83 and \$1.88 per 100 chicks hatched was made by the groups of hatcheries with a capacity of from 20,000 to 40,000 and 80,000 and over, respectively. Generally, profit per 100 chicks hatched increased as the egg capacity per hatchery

increased. Hatcheries with a capacity of from 40,000 to 80,000 were less profitable than those hatcheries with a capacity of from 20,000 to 40,000.

Hatching Capacity Utilized.—The number of eggs incubated per year relative to the egg capacity of the incubators is an indication of the utilization of the hatching capacity. Maryland hatcherymen utilized their total hatching capacity 2.6 times per year on the average.

As the capacity utilized increased, the number of chicks hatched and the number of days of hatchery operation increased. The largest number of chicks hatched per hatchery was in the group of hatcheries utilizing their hatchery space five times and over.

Hatcheries setting fewer eggs per year than the capacity showed a loss of \$1.89 per 100 chicks hatched; the groups of hatcheries setting 2 to 2.9 times and 5 times and over the capacity showed a profit of \$198 and \$2.01 per 100 chicks hatched, respectively.

Selling Cost.—Selling cost of chicks varies according to the amount of advertising, the extent to which telephone and telegraph is used in transacting business and the distance which chicks are delivered. Sometimes the additional incurred selling cost is offset by an increased selling price.

A profit of \$2.52 per 100 chicks hatched was made when the selling cost was less than \$1 per 1,000 chicks hatched. As the selling cost per 100 chicks hatched increased, the profit decreased, with the exception of the group of hatcheries which had a selling cost from \$3 to \$3.99 per 1,000 chicks hatched and an average profit of \$1.84 per chicks hatched.

Cost of Allowances.—The cost of allowances includes the value of chicks given as extras, the value of replacements, and the value of chicks for which money was not collected. The cost of extra chicks to the hatcherymen may seem rather insignificant at the time he tosses in 2 to 4 chicks per 100 sold; however, that expense, plus replacements and bad debts accounted for about 4 per cent of the total cost of producing and selling chicks.

Hatcheries with a selling cost of less than \$2 and from \$3 to \$4 per 1,000 chicks sold had an average profit of \$2.04 and \$2.11 per 100 chicks hatched, respectively. Cost per 100 chicks hatched increased as the cost of allowances increased.

There was an inverse relationship between the cost of allowances and the number of chicks hatched per hatchery. Those hatcheries having the lowest cost of allowances had the largest number of chicks hatched per hatchery.

Length of Hatchery Operation.—The length of the hatchery season varied from three weeks to twelve months, depending upon the demand for chicks. Income, cost and profit per hatchery increased with an increase in the length of the hatchery season.

There was a positive correlation between the number of days the hatchery was operated, the number of chicks hatched per hatchery, and the hatchery capacity utilized. About 18 per cent of the hatcheries studied operated less than 90 days, and about 12 per cent operated over 215 days.

CUSTOM HATCHING

Custom hatching refers to that phase of hatchery operation in which the hatcheryman accepts eggs to be placed in his incubators at a fixed price per egg set, returning to the owner of the eggs the chicks hatched therefrom.

Some 64.6 per cent of the hatcheries in the United States were

doing some custom hatching in 1937-38, according to Termohlen, Warren, and Lamson (1940). The percentage of hatcheries doing custom hatching ranged from 23.1 per cent in the New England region, where breeder hatcheries predominate, to 84 per cent in the West North Central States, and 86.3 per cent in the West South Central region.

Evidently, custom hatching has declined. A special report issued by the U. S. Bureau of Agricultural Economics in April 1944 indicated that "custom hatched" chicks comprised only 6.5 per cent of the chickens raised in 1943 compared to 11.9 per cent in 1934.

Properly handled, custom hatching can be made a relatively profitable phase of hatchery operation. But when custom hatch prices of as low as 2 to 2½ cents an egg are charged, it is possible for farmers to go to the hatchery flock owners, buy hatching eggs at the regular premium prices paid by the hatchery, take them to the hatchery to be custom hatched, and obtain chicks at a cost of 1 to 3 cents less than the prices quoted on the chicks by the hatchery. Thus, unprofitable custom hatching may compete seriously with the hatchery's regular chick output.

Costs in Custom Hatching.—Many hatcherymen labor under the delusion that little or no expense is involved in custom hatching, consequently, they are under the impression that the price received for custom hatching is practically clear profit. Office record work is involved in handling custom hatching business, and labor is required in operating the incubators. In addition, there are various indirect costs, such as heat, light, power, water, repairs, supplies, taxes, insurance, depreciation, and rent. Custom eggs must bear just as much of the indirect expense as eggs purchased by the hatchery and placed in the incubator.

Lowrie (1929) found that labor costs amounted to \$1.19 for each 100 eggs, while the indirect costs totaled 84 cents, making an average cost of \$2.03 to custom hatch each 100 eggs.

Warren and Wermel (1935) reported a custom hatching cost of \$2.07 for each 100 eggs, the average range of the hatcheries reporting on the 1934 season being from \$1.32 to \$2.82. Poffenberger and DeVault (1939) found that the average cost of custom hatching in Maryland hatcheries surveyed in 1936-38 was \$1.21 per 100 eggs incubated.

XVII

BABY CHICK SHOWS

THE FIRST baby chick show was held at Kansas State College in 1926 under the direction of the poultry department of that institution. Since that time, baby chick shows have been held in other states under the sponsorship of poultry improvement associations, state departments of agriculture, county Farm Bureau organizations, and sometimes the college poultry departments.

There was considerable interest in chick shows for many years, but along about 1939 and 1940, interest began to lag and fewer shows were held. Just how important a place they will play in the future is a little difficult to foresee. It may be that the newness and novelty have worn off somewhat.

Through competition with hatcherymen from his own state or from other states, the hatcheryman should develop a greater knowledge of the characteristics which make for differences in chick quality. With this knowledge, he should be able to correct his errors in flock management, or incubation, and exercise greater care in the selection and culling of chicks before making shipments. Winnings in baby chick shows may have considerable advertising value.

Staging a Chick Show.—Usually no fee is required to enter chicks in the show. The chicks, however, become the property of the show. Since some expense will be incurred in providing trophies and ribbons for the winners, and in cooping and feeding the chicks, funds are generally obtained by auctioning off the chicks at the close of the show and by the rental of space to commercial exhibitors. Where it is necessary to rent special quarters for holding the show, this latter method of financing is practically necessary.

When the show depends entirely upon the proceeds from the auction, it is important that the auction be given as much publicity as possible. Bids should be opened on some popular variety for which there is apt to be a large number of bidders. It is important that

the first chicks auctioned off bring the highest prices, for the first sales very largely determine the price level of the entire auction.

So that visitors may see and examine the different entries, the chicks*are usually placed in primary brooders of the corrugated board type sometimes covered with glass.

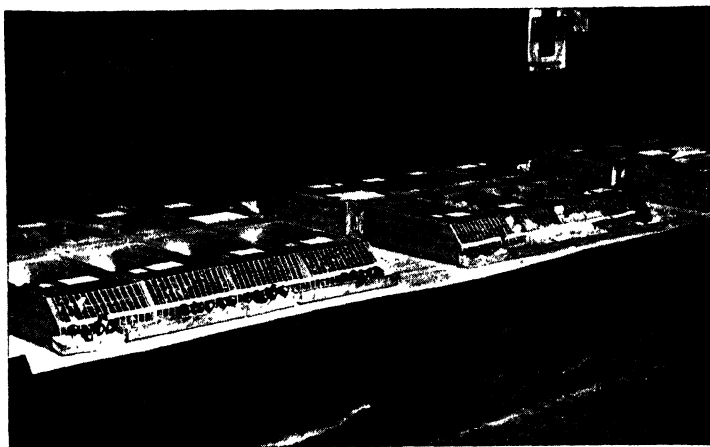


Fig. 101.—View of a section of the baby chick show at the Pennsylvania Farm Show. Special, glass-covered compartments with wire fronts through which the chicks can eat, show the chicks to good advantage.

After the chicks are judged, they are fed and watered during the remainder of the show until disposed of. Since many shows last three or four days, it is necessary to feed and water them. It is more advisable, however, not to feed before the judging unless absolutely necessary.

Classification of Entries.—A single entry in a baby chick show generally consists of 25 chicks. Some shows have no limit to the number of entries a hatchery or breeder may make; others limit an exhibitor to one entry in each class.

In some shows, there are classes for all breeds and varieties, although most always there are so few entries in the odd or rare breeds that they are generally entered in one or two classes especially provided for odd breeds. In other shows, classes are provided only for

the more common and popular breeds, with possibly one class for all others besides these few popular ones.

Separate classes or sections are often provided for different types of exhibitors on some such basis as follows:

1. R.O.P. section, open only to R.O.P. breeders.
2. Certified section, open only to certified hatcheries or breeders.



Fig. 102.—Judging chicks at a baby chick show. (*Ohio State University.*)

3. Breeder section, open only to those who hatch eggs produced on their own farms.

4. Hatchery section, open to any and all hatcheries.

5. Local hatchery section, open only to hatcheries located in the state where the show is held.

6. Broiler section, for chicks produced primarily for broilers, including crossbred chicks.

In Ohio a plan different from the ordinary chick show is used. The Poultry Science Club of Ohio State University puts on the show,

and the entries consists not of chicks, but of eggs. Each entry consists of 50 eggs, which are scored, then the eggs are hatched and scored on hatchability, and, finally, the chicks that hatch are scored. The final score of the entry is determined by the score of the eggs, plus the hatchability score, plus the score on the chicks, the eggs and hatchability each counting 25 per cent of the total, and the chicks the other 50 per cent.

SELECTION OF CHICKS FOR SHOWS

In selecting chicks for show, three things are absolutely vital:

1. The flocks from which the chicks are hatched must be good, strong, and vigorous.
2. The incubation conditions must be correct.
3. The person doing the selecting must know good chicks and must have the patience to go over large numbers in order to get good entries.

No person can select prize winning chicks if the chicks are poor to begin with, due either to poor flocks or faulty incubation. Neither is a person with no experience apt to take good chicks and select winning entries.

The Score Card.—Practically all chick shows are judged by the score card method, and because of the numbers involved, this is the only practical method. Furthermore, it gives each exhibitor the exact reasons why his entry places as it does.

There is no universally used chick score card. Different shows vary some, but essentially chick score cards are very much alike. Obviously, however, in selecting for any particular show, the score card to be used should be available and used as a basis when the entries are sorted and made up.

We have included here one used at the old Chicago Coliseum Poultry Show. It is essentially the same as the one in the *American Standard of Perfection*. For a description of the appearance of chicks of the different breeds, see the *Standard of Perfection*.

The score card is more or less self explanatory and no detailed explanation is needed.

Select for Vigor.—In selecting an entry, a large number of chicks should be available and the selection should be done where

BABY CHICK SHOWS

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SCORE CARD FOR BABY CHICKS

	Perfect Score	Cuts	
Vigor	25		$\frac{1}{4}$ to 1 point will be cut for each droopy chick lacking alertness and activity. $\frac{1}{4}$ to $\frac{1}{2}$ point will be cut for every chick showing a narrow, weak head. $\frac{1}{4}$ to $\frac{1}{2}$ point will be cut for every chick showing a small or sunken eye. $\frac{1}{4}$ to $\frac{1}{2}$ point will be cut for every chick showing shriveled legs or toes.
Condition	25		$\frac{1}{8}$ to $\frac{1}{4}$ point will be cut for every chick showing an improperly healed navel. $\frac{1}{4}$ to $\frac{1}{2}$ point will be cut for every chick showing sticky eyes, pasty vent or soiled down. $\frac{1}{8}$ to $\frac{1}{4}$ point will be cut for every chick showing short or thin down. $\frac{1}{8}$ to $\frac{1}{4}$ point will be cut for each chick showing weak pigmentation of beak and shanks.
Trueness to Variety Color	15		$\frac{1}{4}$ to $\frac{1}{2}$ point will be cut for each chick digressing too markedly from color description as listed in Standard of Perfection. $\frac{1}{8}$ point will be cut for each chick with leg color other than listed in Standard of Perfection. $\frac{1}{4}$ to $\frac{1}{2}$ point will be cut for each chick digressing from shape and feathering normal to breed.
Uniformity of color	15		$\frac{1}{8}$ to $\frac{1}{4}$ point will be cut for each chick varying from the average in color of down. $\frac{1}{8}$ point will be cut for each chick varying from the average in shank color.
Uniformity of Size	10		$\frac{1}{4}$ point will be cut for each chick varying from the average in size.
Weight	10		Standard weight of each 25 chicks will be 2 lbs. 4 ounces. $\frac{1}{4}$ point will be cut for each ounce under this weight down to 2 pounds. 1 point will be cut for each ounce under 2 pounds.
Disqualifications:			A cut of 5 points will be made for each of the following disqualifications. (Such a large cut for each disqualification eliminates the entry from winning but permits each exhibitor to have a complete record of the score of his entry.) 1. Each dead chick. 2. Comb of type foreign to the breed of variety. 3. In all breeds required to have unfeathered shanks, any down, feather or feathers, stub, stubs, or feather-like growth on shanks, feet, toes, or hocks; or unmistakable indications of down, feathers, stub, or stubs having been plucked from same. 4. Side sprig on single combs. 5. Web feet in any breed of chickens, or abnormal number of toes for the breed in variety.

Fig. 103.—A typical score card for use in judging baby chicks.

there is good light. As the chicks are brought out and placed on the sorting table or in sorting boxes, the weak ones should be immediately removed. This condition will be indicated by droopiness and often sleepiness (although sleepiness is not a sure sign and should be checked by tapping a pencil on the floor or side of the box and the lively, vigorous ones will immediately liven up), short backs, sunken eyes, shriveled legs, wabby on the feet, etc.



Fig. 104.—The down has been parted to show varying degrees of improperly healed navels in newly hatched chicks. The chick on the extreme left is normal. (*International Baby Chick News.*)

Those chicks showing poor condition as indicated by pasty, soiled, or sticky down, short down, and lack of pigment in the legs, should be removed. This should pretty well remove most of the weak ones and those out of condition.

Disqualifications and Defects.—Now each chick should be carefully handled. First look for disqualifications, or defects that cut so heavily it virtually amounts to the same thing, such as combs foreign to the breed (single combs in Wyandottes being an instance), feathers or stubs on the shanks in clean shanked breeds, crooked toes, web feet, cross beaks, one eye gone, and others.

Condition.—Next feel of the navel with the forefinger and look at it by blowing away the down, discarding any that are not perfectly healed. Then discard those that have that hollow, skinny feel about them; because they are likely underweight and lack vitality and strength to stand shipment. Every chick saved should be full, plump, and reasonably solid. A person will very soon learn to identify the strong vigorous chicks by the feel alone.

Uniformity.—Then those remaining should again be placed on the sorting table, or boxes, and those varying too much in color from

the normal for the breed should be removed, and overly large or small ones taken out. There should now remain a good selection of strong thrifty chicks, uniform in size, and free from disqualifications.

The problem now is to select 25 (with one or two extras) that look exactly alike or very nearly so. In both colored and white varieties, there will be variations in the shades, and all those in one entry should be exactly the same shade.

In White Rocks, for instance, the entry should be either pure white or uniformly smoky; in Reds, either all light or all dark; in Leghorns, all should be uniformly pure white or of the same yellowish or greenish tinge as the case may be, etc. Also see that leg color or leg pigment is uniform. In Barred Rocks, for instance, see that the head spots are uniform.

This part of the selection is of the utmost importance, because lack of uniformity means little chance to place among the winners. In other words, when you get through, have 25 or 26 chicks as near alike as possible to get them.

Weight.—Then weigh them to be sure they weigh over 2 pounds net. They will lose some in shipment, and must weigh 2 pounds net at the show.

And don't send chicks that are too old. If the wings are sprouted by the time they are judged, their chances are slim, because they will lack uniformity, will be underweight in all probability, and are apt to be weak from lack of food. The fresher the chicks are, the better they look, and the better they handle.

XVIII

PLANNING THE ADVERTISING PROGRAM

SUCCESS in the hatchery business depends upon:

1. The production of good chicks.
2. The selling of these chicks in large enough quantities and at prices that will yield a profit.

Many hatcherymen have solved their production problems. They have developed high grade flocks, and have, by close supervision, assured themselves of a dependable supply of good, hatchable eggs. They have taken these eggs and placed them in their modern scientific hatching equipment, incubated them, and brought forth sturdy, bright-eyed baby chicks.

But for many of these hatcherymen who are so skillful in their production efforts, the selling problem has been a stumbling block. Consequently, merchandising becomes their chief concern.

Every hatcheryman should have a merchandising plan. He should know who the chick buyers are, how to reach them, what selling appeals are most effective, how much to spend for advertising, and many other things.

Who Buys Chicks?—There are two kinds of outlets for baby chicks: namely, *wholesale* and *retail*.

Many large hatcheries have *wholesale* connections such as (1) bird stores and dog shops, (2) hardware stores, (3) feed dealers, (4) poultrymen who sell chicks, (5) people who take orders and solicit business as a means of livelihood, (6) large mail order houses, (7) seed companies, and (8) poultry feed and supply stores.

Sales of chicks to organized groups of poultry raisers, usually cooperative poultry and egg marketing associations, constitute another but less common type of wholesale outlet.

Wholesale prices, of course, are much below retail. Some hatcheries sell practically their entire output in this manner, while others conduct this wholesale business along with their retail sales. Many

hatcherymen personally contact dealers during the summer, fall or early winter. Individual jobbers and solicitors are sometimes obtained through newspaper "want ads" or through special offers in circulars going to the hatcheryman's regular retail prospect list.

Contracts are often used, the dealers agreeing to take so many chicks each week, and the hatcheries agreeing to furnish them, but the contracts are often worthless, for the dealers won't take the chicks if they can't sell them.



Fig. 105.—To secure repeat business, the hatchery must deliver healthy, vigorous chicks that develop into a profitable flock and result in a satisfied customer.

But the average hatcheryman has to depend upon *retail* sales to dispose of his chicks. His logical prospects, therefore, are commercial poultrymen, farmers, and back-lot poultry raisers. His selling program must be directed to reach these people. •

What to Spend on Advertising.—How much to spend for advertising is an important question. Some of the most successful hatcherymen allow approximately 1 cent a chick for advertising. When the prices are higher, this may run as high as 2 and 3 cents a chick. Hooper (1932) found that the average advertising expendi-

ture for nine Ohio hatcheries studied in 1930 was 11.11 per cent of the total cost to produce 100 chicks. Poffenberger and DeVault (1939) found that the average advertising cost was only 11 cents for each 100 chicks sold. The amount spent for advertising will depend largely on the type of business, whether local or mail order.

It must be understood, of course, that this expenditure for advertising includes all forms of advertising in which an expense is incurred. It may include publication advertising, a catalog, broadsides, letters, radio, exhibits, novelties, or other media.

Mail Order or Local Sales?—One of the first things to decide in planning the hatchery selling campaign is whether the chicks are to be sold in the immediate territory or sold by mail and shipped to distant points.

A hatchery that can dispose of its entire output locally at satisfactory prices would have no reason to seek distant buyers. If, however, the output of the hatchery or hatcheries in a community is much greater than can be absorbed locally, it is a foregone conclusion that customers must be secured from a wider area. It may embrace several additional counties, an entire state, or any point in the United States within the shipping limits prescribed by parcel post and express rules.

The high grade breeder-hatchery carrying out a program of breeding that justifies higher prices, likewise, will find it necessary to reach out into a larger territory for its customers.

A carefully planned program of selling chicks by mail would include:

1. Advertising in poultry and farm publications, and possibly in metropolitan newspapers.

2. Direct mail in its various forms.

And it might include:

3. Radio broadcasts.

4. Exhibits at major farm events such as state fairs, state poultry shows, etc.

While a mail order campaign includes only a few forms of advertising, a well planned local selling campaign might involve:

1. Newspaper advertising.

2. Window displays.

3. Direct mail in its various forms.

4. Outdoor advertising.
5. Canvassing.
6. Telephone.
7. Poultry schools and clinics.
8. Exhibits at county fairs.
9. Hatchery openings.
10. Radio broadcasts from low power stations.

The execution of the various forms of advertising for both mail order and local chick selling campaigns are discussed in detail in the chapters which follow.

The Advertising Agency.—Because advertising and selling is such a specialized field, many hatcherymen entrust these problems to an advertising agency. It is surprising how much help a qualified agency, experienced in the handling of hatchery accounts, can offer.

The services of an agency start with the planning of the campaign and continue through until the last publisher's bill has been audited and paid. The preliminary work is done several months in advance of the actual chick selling season when the hatcheryman and the advertising agent get together and consider whether the chicks are to be shipped or marketed locally, whether a complete catalog or folders and letters will be depended upon, and similar problems. Then comes the actual writing and laying out of the advertisements, the ordering of cuts, the placing of space in poultry and farm publications, and the checking and paying of bills.

Because the better agencies have the proper facilities, sufficient experience, and adequate capital, they are "recognized" by the publishers of poultry magazines and other publications who allow a commission which serves as the agency's remuneration. The preparation of catalogs, broadsides, letters and other mailing pieces is handled with a special service charge.

Another type of organization equipped to aid the hatcheryman in his selling problems is the printing firm employing specialists skilled in the writing and preparation of direct-mail advertising for hatcheries. Usually, such an organization does not place any advertising in publications, but confines its efforts to the preparation of catalogs, letters, folders, and other printed material.

Some firms offer syndicated local sales campaign material consisting of mailing pieces with the art work, illustrations, and cer-

tain portions of the selling information standardized. These folders are imprinted with the hatcheryman's name, address, prices, guarantee, testimonials, etc., with some additional space available for his special selling points. This makes it possible for the hatcheryman doing a small local business to obtain attractive, colorful selling literature without going to heavy expense for art work, illustrations, and color printing. Since each hatcheryman using the campaign is given exclusive territorial rights covering certain counties, these folders have the appearance of being specially prepared.

Still another advertising service available to the hatcheryman is that offered by the independent advertising man who charges a specified fee for writing the copy and preparing the layouts for direct-mail pieces which the hatcheryman can have printed by the printer of his own choice. In the case of letters, many hatcherymen have the necessary duplicating equipment for producing the letters.

Space Buying.—Before attempting to select a list of farm and poultry papers in which the advertising message is to be placed, the hatcheryman or breeder should make an effort to become familiar with all publications in the field; some are better adapted than others to sell chicks. In considering various publications, study such factors as circulation, editorial content, and cost.

1. **Circulation.** The hatchery having a limited chick output, in all likelihood, will find it best to confine its selling efforts to a limited territory, using publications having heavy circulation in the states in which it is desired to sell chicks. This may mean the use of state farm papers, poultry magazines having the bulk of their circulation concentrated in the selling area, or the regional editions of national poultry magazines.

All publications are glad to send advertisers complete statements showing the distribution of their magazine by states and territories. Those publications whose methods of securing circulation are carefully scrutinized and whose subscription lists are checked by the Audit Bureau of Circulations, an impartial organization, have what is known as A.B.C. circulation. An A.B.C. statement shows the net paid circulation by states, rates at which the subscriptions are sold, the sources, and other information. A publication with a high proportion of direct-mail subscription orders is likely to be a good medium for the hatchery advertiser.

2. Editorial content. Is the publication edited to appeal to the type of poultry raiser to whom you would like to sell chicks? A poultry magazine containing a variety of factful, interesting articles on all phases of brooding and flock management should certainly have greater appeal to chick raisers than a magazine filled with wordy "write-ups" about advertisers. Similarly, a farm paper with a good poultry department should make a better advertising medium than a paper with a poorly edited poultry page.

Many hatcherymen have wasted money advertising in publications which gave them "write-ups." While these "write-ups" sometimes do stimulate inquiries temporarily, in the long run, they will be found to be of very little advantage. Magazines addicted to the "write-up" habit soon lose reader confidence.

The type of cooperation which the hatcheryman should seek is that which attempts to increase the general responsiveness for all advertisers in the publication.

3. Cost. This is an important item. Advertising rates are based on a charge per agate line. There are 14 agate lines to the column inch. Thus, a column inch of advertising in a poultry magazine with an agate line rate of \$1 would cost \$14.

The publication with the lowest advertising rate is not always the most economical when the number of readers it reaches is considered. Advertising rates of different publications may be compared by obtaining "the rate per inch per thousand copies." To obtain the cost of reaching 1,000 readers with a one inch advertisement in a magazine having a rate of \$14 an inch for a circulation of 100,000 copies, divide \$14 by 100. This will give 14 cents as the cost to reach 1,000 readers. By the same process of division, it will be found that it costs slightly more than 23 cents to reach 1,000 readers of a magazine with a circulation of 30,000 and an inch rate of \$7.

The advantage in rate which the larger publication possesses, however, may be offset if the circulation of the smaller magazine is more concentrated in the immediate selling territory.

Inquiry and Sales Costs.—The real test of a publication's ability to produce orders for chicks will be indicated by the returns from the advertising in each publication used.

Key each advertisement. The common method of keying advertisements is to include a box number in the address. One pub-

INQUIRY AND SALES RECORD

Key _____ Publication _____ Record Begun _____

	ING.	ORD.	AMOUNT	ING.	ORD.	AMOUNT	ING.	ORD.	AMOUNT	ING.	ORD.	AMOUNT	ING.	ORD.	AMOUNT	ING.	ORD.	AMOUNT	ING.	ORD.	AMOUNT
1																					
2																					
3																					

30																					
31																					
Total																					
Total to Date																					
Cost Per Inquiry																					
Cost per \$ of Sale																					
Cost to Date																					

Fig. 106.—An advertising checking record makes it possible for the hatcheryman to know how each keyed advertisement is producing on both inquiries and sales. (*Everybodys Poultry Magazine*.)

lication, for example, may have "Box 23" as its key; another, "Box 24," and so on. Hatcheries located on farms, even though the mail is secured direct from the postoffice, sometimes use "Route 4A," "Route 4B," etc. If the hatchery occupies considerable frontage on a street, it is possible, for example, to use 609 as the address in one magazine, 611 in another, etc.

The replies should be tabulated each day on suitable forms and credited to the publications from which they originated. Unkeyed returns should be credited in the ratio of the keyed returns. Thus, if a magazine is producing 10 per cent of the inquiries, it should receive credit for 10 per cent of the unkeyed inquiries.

While inquiry cost is an important item, sales cost is the ultimate factor in determining the worth of a publication. A magazine may have a low inquiry cost, but because its readers are of the inquisitive type and possess little buying power, the sales cost is bound to be high. When this means a 10 or 15 per cent difference in the business produced by two publications, the extra effort necessary to check the sales cost is certainly worthwhile.

While most hatcherymen set up their own systems for recording inquiries and sales, a number of farm and poultry publications offer compact record books which simplify the keeping of this information.

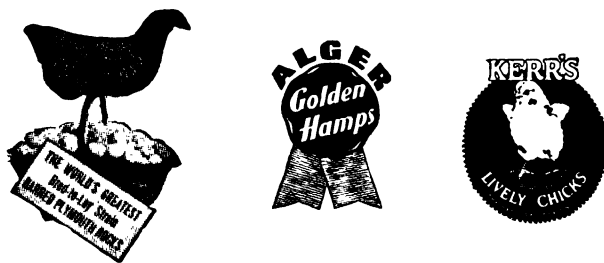


Fig. 107.—Consistent use of a trademark is valuable advertising.

Trademarks.—Consistent use of a trademark has helped to establish the names of certain breeders and hatcherymen in the minds of poultry raisers.

A distinctive trademark, one that is easy to remember, can be used to advantage on letterheads, envelopes, shipping labels and

chick boxes, tire covers, side of delivery truck, road signs, in catalogs and folders, and in magazine and newspaper advertisements. Used in this manner, the trademark will tie up all forms of advertising used by the hatchery.

Some hatcherymen who advertise rather consistently in small space achieve somewhat the effect of a trademark by using the same heading design in their advertisements right along, even though the message under the heading may change from month to month.

XIX

APPEALS THAT SELL CHICKS

WHILE A GREAT many different appeals are used in hatchery advertising, a careful analysis will reveal the fact that practically all of these appeals are based on the desire of poultry raisers to make a profit on the chicks they raise.

An earnest effort has been made in this chapter to classify the various types of appeals used in selling baby chicks. Many examples are offered to show how successful hatcherymen are handling these appeals, but their use here should not be construed as a guarantee of their effectiveness. An offer of free feed with each 100 chicks ordered, for example, may bring very good results under certain conditions, but when the same offer is made by the majority of hatcherymen in a certain selling territory, it is likely to be very weak. The hatcheryman who can dress up and present an appeal in a manner different than his competitors has the advantage in merchandising chicks.

GENERAL APPEALS

Favorable Economic Conditions.—When poultry and eggs are bringing good prices, it is not difficult to convince people that it is profitable to raise poultry, but when prices are extremely low, it is another matter. Although it is difficult to forecast with marked accuracy the conditions in the poultry industry for six months to a year ahead, a study of certain factors will often bring out the trends. A hatcheryman who is a keen student of conditions can, when the opportunity presents itself, point out the factors which make the outlook favorable.

In order to get a picture of the conditions and outlook in the poultry industry at any specific time, the following factors should be considered:

1. Condition of the egg market. What are present prices? How

do they compare with last year? How do storage holdings compare with last year? With the five year average? Are egg receipts heavier or lighter than they were at the same time last year? 'Is egg consumption increasing or decreasing in the various markets?

2. Number of laying hens on farms. Are there more or less hens than there were at the same time last year? Has culling been heavy? Are the pullets coming into production later or earlier than usual?

3. Feed prices. How do they compare with a year ago? Will present crop conditions tend to raise or lower feed prices?

4. Cash income of farmers. Do farmers have cash? Have any of the regular cash crops failed?

Much of this information can be secured through a study of market and crop reports issued by the government and published in market papers as well as in poultry journals; some can be obtained only through the hatcheryman's own observations. Rather than attempt to make their own analysis of conditions, many hatcherymen simply quote some article on this subject from a farm, market or poultry paper, giving the name and date of issue of the publication containing this article.

When economic conditions in the poultry business are unfavorable, it is well to point out that the poultry cycle is a relatively short one. Many people quit chickens when feed costs are up and prices for eggs and poultry are not what they think they should be. People who stay with chickens at that time are the ones who will profit over a period of years. Stress the importance of getting chicks from well-bred stock.

RELIABILITY

People like to know whether or not the hatcheryman with whom they intend to do business is reliable. The use of good references in publication advertising as well as in the catalog will help to dispel any doubts.

References.—The bank with which the hatcheryman does business is usually willing to act as a reference concerning his financial responsibility, often furnishing a letter for reproduction in the hatchery catalog. Publications carrying the hatchery's advertising, likewise, have no objection to serving as a reference.

Time in Business.—Hatcherymen who have been established for

some considerable period of time have a point well worth playing up in their advertising, especially in their catalogs, for long establishment in business, in the minds of many people, is a good indication of reliability. For this reason, "Backed by an unbroken record of 50 years of specialized breeding," "Carefully selected, trapnested and pedigreed for eggs and Standard qualities since 1889," "20 years hatching best quality chicks," are statements which, if backed by interesting catalog stories, will carry weight.

QUALITY OF STOCK

Egg Laying Ability.—Many different factors influence flock profits, but in the minds of most poultry raisers, egg production is of paramount importance.



BABCOCK'S *healthy* **CHICKS**

THAT MAKE WORLD CHAMPIONS
Make GREAT COMMERCIAL LAYERS Too

You get top laying performance when you buy Babcock's Chicks because they are bred to produce. Your chicks for 1946 will inherit the breeding of our past Contest pens and a good measure of the same breeding as the World Record Pen.

Establish a commercial laying flock with Babcock's Healthy Chicks or use them for flock improvement. They're profitmakers either way.



The New All Time World Record Pen

Herr's the pen that established a new world record of 4067 eggs for 4336.25 points in 51 weeks at the Western New York Contest. They are big, rangy hens with big egg and feed capacity. Babcock's layers have to be large and rangy to produce so many big eggs.

Open Dates On Babcock's Chicks

As this is written (Dec. 29) we can supply you with White Leghorn Chicks after May 1st and until Sept. 12th. To save time send a deposit of \$5 per chick with your order and let us know date desired, straight run, pullets or cockerels.

Write For Catalog That Is Different

Send for an interesting catalog that is different. Tells you what our chicks will do and won't do for you. Write today.

BABCOCK POULTRY FARM
 Route 3 E ITHACA, N. Y.

Fig. 108.—This advertisement is built around a new world record made in an official laying test.

Every hatcheryman can describe his breeding program, what qualities are emphasized in selecting breeders, trapnesting, actual methods of culling flocks, and similar points to show that he is breeding for egg production.

PIONEER BREEDING




WING-BANDING PIONEER CHICKS—
Each Pioneer Chick used on our ranches for breeding is wing-banded to provide a permanent record of its ancestry.

**The Solid BACKGROUND
for your
FUTURE EGG PROFITS**

To know *how* Pioneer chicks are bred is to understand *why* they excel in all-around performance. These young huskies represent a huge investment in breeding stock, research and equipment. Even *more* important are the seasoned judgment and uncompromising standards of the men who *control* their breeding. No expense is spared, no detail overlooked to give you a sturdier, stronger-laying White Leghorn chick.

BRED TO "TAKE IT"

Pedigreed dam and sire—both from Pioneer's basic breeding stock. * Trapnested and culled for 20 years, our high-record mating flocks reflect *survival of the fittest*. Range reared, range fed, they have the stamina so necessary for commercial success. When you buy Pioneer chicks, this breeding program becomes *your* asset in the form of rugged health, higher yield, greater profits. Write now for prices. * Consult our **FREE** Service Dep't.

FREE

Mail Coupon or Post Card

Please send me:
 "Pioneer Hatching" as issued. ☐
 Booklet, "The Care of Baby Chicks." ☐

NAME _____

ADDRESS _____



**The PIONEER
HATCHERY
and BREEDING FARMS**
 PETALUMA • CALIFORNIA

AMERICA'S OLDEST COMMERCIAL HATCHERY

Fig. 109.—A distinctive mail order advertisement that emphasizes the breeding back of the chicks.

It is easy enough to tell what you are doing in breeding for more eggs, but to be able to offer convincing evidence is an entirely different matter. Proof of laying ability can be supplied by mentioning:

1. Reports from customers.
2. Official egg laying contest records, supported by reproductions of the record sheets showing when the heaviest production occurred.
3. Record of performance attainments.

4. Purchases or importations of pedigreed stock, backed by reproductions of one or more pedigrees in the catalog.

5. Flock averages of flocks supplying eggs to the hatchery.

With definite evidence, it is possible to prove that your stock is bred for winter egg production, that broodiness is practically unknown, or that your stock has been selected for persistency.

A PULLORUM-CLEAN FLOCK

No Reactors Found in 12 Years of Official Tests

As a remedy or cure exists for the most serious of the whole pullorum disease, we can now know, as hatchery white, that it is the only way of eradicating this disease is to breed from the flock, we can now know for which happens to be a real test.

Since New Hampshire is considered as a New Hampshire, U. S. Pullorum Clean Flock. This means that all incoming birds were tested and that not a single one of the pullorum disease was found in our entire flock. One flock containing the pullorum disease in New Hampshire, the only flock in Pullorum Clean.

The work of blood testing for pullorum disease is not only a matter of health, but also of profit. It is a matter of health, but also of profit.

the Division of Animal Industries, New Hampshire, Department of Agriculture, Concord, New Hampshire. The test is a simple method of the pullorum disease, but it is not a cure for the disease, it is a test.

During the last 12 years, no reactor has been found in our flocks. We can test our plant, you would be surprised with the same amount and sanitation practices followed to keep our flock clean and healthy.

So when you purchase White's chicks, you can be sure that they come from a flock which has been tested free of pullorum disease and from breeding birds having plenty of stamina and resistance back of them. Given ordinary good care of management chicks with such a background will make money for the average flock owner.

Every one of the White's chicks is tested for pullorum disease. The test is a simple method of the pullorum disease, but it is not a cure for the disease, it is a test.

A flock of one of the pullorum disease, all breeding birds in the background you can see a pullorum disease, but it is not a cure for the disease, it is a test.



Fig. 110.—This page from a hatchery catalog stresses the fact that the flock is pullorum-clean.

Egg Size.—Size of egg affects profits. In records kept at the Vineland Egg Laying Contest, there was a difference of \$1.85 in the value of the eggs laid by two hens having approximately the same records, the difference being caused by the fact that the eggs of one hen graded largely as "seconds."

While it is easy enough to claim that only eggs weighing 24 ounces or more to the dozen are being set, more positive evidence can be

offered in the form of letters from customers or egg records made in egg laying contests using the point system. Be sure that the point system is clearly explained.

Official Supervision.—Few hatcheries participating in the breeding or pullorum eradication phases of the National Poultry Improvement Plan know how to get this fact across to their prospective customers. A careful explanation of the program in simple words is worth at least a page or more. The average poultry raiser may not understand that R.O.P. means “record of performance,” and he may have no idea as to what it involves. Don’t take too much for granted.

If the advertising and printed literature has to be submitted to state officials for approval, it is well to mention this point in order to gain additional confidence in what you have to offer.

Blood Testing.—Show your prospect that blood testing to remove carriers of pullorum disease results in better livability, that he will save money by purchasing chicks from a flock which has been tested and the reactors removed. Cite definite figures from experimental work and grow healthy chicks campaigns.

Flock Management.—Flocks that are well fed, properly housed and rightly managed will produce better chicks than a flock of similar breeding poorly managed. Deficient rations, insanitary conditions, and poor ventilation weaken the breeding stock. What type of feeding and housing program do your flock owners have to follow in order to supply you with hatching eggs?

QUALITY OF THE CHICKS

Weak, undersized chicks are usually handicapped right from the start. The use of small hatching eggs, improper incubation, poor selection of chicks for shipment, and other factors will affect chick quality. Faith in the hatchery’s ability to turn out quality chicks can be built up by explaining certain practices followed in the hatchery.

Incubation Methods.—This example from the catalog of a Missouri hatchery describes the precautions taken in the selection of eggs and in the operation of the incubators to insure sturdy, livable chicks:

From the time the pure fresh eggs are received at the hatchery until the large, fluffy chicks are shipped to you in sanitary boxes, every precaution is taken to insure the utmost in quality of Premier Chicks.

All eggs are carefully culled and graded before being set. There is an accurate egg scale within reach of each person trying eggs, and if he is in doubt as to the size of an egg, that egg is weighed and discarded if it does not measure up to our large size.

As an extra safeguard to insure absolute sanitation in our hatchery and health in our chicks, the incubators are fumigated during each hatch with formaldehyde gas to kill all disease germs and prevent the spread of any disease that might be contracted by the newly hatched chicks.

Our hatching equipment is the very latest and best available. Automatic controls on the incubators and constant inspection by expert attendants insure uniformly excellent hatching conditions. An abundant supply of pure fresh air together with proper moisture and exact temperature conditions bring forth healthy chicks that are hatched brim full of life and vitality.

Selection of Chicks.—The method of inspecting and packing chicks for shipment is important. A New Hampshire poultryman with this brief catalog description, tells how he does it:

Every box of chicks is carefully sorted and all chicks that are not of good size, are deformed or that show a lack of vigor are culled out.

If you buy — Farms Reds you do not have weak, small chicks to fuss with. Every chick is large, strong, and healthy and able and ready to take care of itself

Chick Show Winnings.—Winnings at baby chick shows are well worth playing up. A hatcheryman can offer no better advance proof of his ability to select good chicks for vigor, condition, size, uniformity, and freedom from defects and disqualifications. The points on which the baby chick score card is based should be emphasized.

Livability.—Many hatcherymen now supply their customers with chick brooding records on which they can record the mortality of the chicks to three weeks of age. Some of these records are in the form of postcards already addressed and of the type requiring no postage, which the poultry raiser can mail to the hatcheryman at the end of the three weeks.

While a summary of all such records helps to emphasize livability in the chicks, selection of a few average reports, not perfect reports, will help to get across the point of good chick livability.

Quality Chicks Versus Cheap Chicks.—In the face of so many extravagant claims made as to the breeding back of some of the extremely low priced chicks, a hatcheryman and breeder who sells higher priced chicks is likely to experience some difficulty in convincing prospects that his chicks are worth the extra few cents. A

New York hatcheryman carried his prospects through this logical reasoning in his catalog:

The chick buyer who buys on price alone is foolish, because a large percentage of the real value of a chick is in its pre-natal breeding. Chicks are just like children. Good traits are transmitted as surely in chicks as in fruit or in people or animals. Blood does count tremendously.

○

BABY CHICK LIVABILITY RECORD

Please keep this card on a handy rack. Each brooding room should have one in front of every figure group rack. And read the attached card promptly.

The average livability of baby chicks has been summarized by the University of California in the following table. It is to be read so-number above on the 15th day per 1000 purchased in the month indicated.

Jan.	927
Feb.	918
Mar.	910
Apr.	902
May	895
June	888
July	880
Aug.	872
Sept.	865
Oct.	858
Nov.	850
Dec.	843

It will be interesting to compare Banded Chick livability with the 15 day average published by the University of California. Example: If on January 1 you receive 1000 Banded Chicks and on January 15 you still have 927—referring to the above table (Jan.—927) this Banded Chickery gave you 9 per cent of live profit.

No. CHICKS		PEN No.		DATE RECD			
DAILY TOTAL	DAILY TOTAL	DAILY TOTAL	DAILY TOTAL	DAILY TOTAL	DAILY TOTAL	DAILY TOTAL	DAILY TOTAL
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
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16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
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24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26
27	27	27	27	27	27	27	27
28	28	28	28	28	28	28	28
29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30

PLEASE NAME CARD BELOW THE MALES

WEAR ON THIS LINE

NAME

Address

Number of Chicks

Date Received

Number Dead or Ailing

LIVABILITY RECORD

Day

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Fig. 111.—This brooder house record sheet made it possible for each customer to compare his own chick livability with the standard compiled by the state university.

A chick, properly born, having back of it years of good breeding, freedom from disease, and careful culling, "survival of the fittest"—such a chick has a big start. It utilizes its food better. It matures more rapidly. It fleshes up quicker. It lays earlier. It lays bigger, better eggs having its own high qualities.

In two or three months, it will easily gain, as a broiler, one to two pounds over its weaker brother. That's worth 30 to 40 cents a pound going. Those early eggs are alone worth far more than the chick's original price.

In egg laying, it gets away for one to two dozen eggs before its poorer sister gets going. Those early eggs are alone worth far more than the chick's original price.

These hereditary facts are fully recognized in the breeding of race horses, 1000-pound butterfat cows, \$25,000 registered bulls, all sorts of animals. Burbank revolutionized fruits and flowers with the same selective inbreeding processes. Farmers select their seed with great care. Only the best kernels from the best formed ears of corn are good enough!

Yet there are still some chick buyers who select baby chicks on price alone. They think that two or three or five cents less per chick, is a real saving. "Why, that's \$4.00 a hundred I can save." But it isn't saved! It is spent many times over, through greater mortality the first few weeks, through greater food consumption without quick returns, through delay in egg production.

They see only the few cents "saving" per chick and fail to consider the advantages of the years of inbred quality—faster growth, greater livability, greater egg production, quicker fleshing, etc.

You just can't deliver this kind of quality chicks as cheap as the plain ordinary mongrel type. Breeding, culling, selecting, blood testing, sanitation, quality food, expert inspection, trapnesting—all these enter into QUALITY—and are worth many times the few extra pennies they cost.

An extra nickel paid for a quality chick often comes back as a 100% dividend with every extra egg or every extra two ounces of flesh which the quality chick produces. And it DOES produce more and better than the "just plain chick." Or else Burbank and all the Breeders and Experiment Stations in the country are dead wrong!

GUARANTEES

Most hatcherymen make some sort of a guarantee on their chicks. Where a guarantee is made with the sincere intention of carrying it out, it can become a powerful selling help, but many hatcherymen assume the attitude that customers are trying to take advantage of them when they ask for replacements under the conditions of the guarantee.

Much of the success of a guarantee, however, depends upon the quality of the chicks sold. Some of the most successful merchandisers among hatcherymen have the broadest guarantees. While a few unscrupulous people may take advantage of them, they know that their guarantees will not result in heavy replacements, for they have full confidence in the quality of the chicks they produce.

A discussion of each of the existing types of hatchery guarantees follows.

Parent Stock.—Many hatcherymen guarantee their baby chicks to be from "purebred stock and that the breeding behind all birds is exactly as represented." This type of guarantee is a rather general one and is not likely to cause any kick back, unless chicks of

1 100% GUARANTEE AS TO GROWTH.
We guarantee every chick to grow to maturity and to lay as well as the parent stock.

2 EVERY CHICK FROM OUR OWN STRAIN, REARED AND PRODUCED EXACTLY AS STATED IN THIS CATALOG.

If your chicks fail to live or grow as well as you expect due to claims for which we should be responsible, report to us promptly.

It is understood that our responsibility will not be greater than the original purchase price. All claims must be made not later than 30 days after date of shipment.

HUBBARD FARMS
WALPOLE, NEW HAMPSHIRE
Branch Hatchery at Lancaster, Pennsylvania

Copyright 1913, Hubbard Farms

As one of the finest poultry breeding farms in America we breed and hatch the most profitable chicks possible. Every care is used to deliver our chicks to you in first class condition, ready to thrive and grow for you. Through our guarantee we take full responsibility for safe arrival and a satisfactory start in your brooder house. Our guarantee is to give you complete protection on all factors that are rightfully our responsibility.

We do ask that you notify us at the first sign of trouble, giving us full information about what is wrong. Many times we can suggest a procedure which will correct the trouble and prevent losses from being severe.

In making claims please keep in mind that we do not take responsibility for management troubles and contagious diseases which are in no way related to the breeding, hatching and shipping of the chicks.

Fig. 112.—Hatcheries that are sure of the quality of their stock can use guarantees effectively. The best guarantees are those which state clearly the extent of the hatchery's responsibility.

some other variety than were ordered happen to find their way into the shipment by accident.

Safe Arrival.—Practically all hatcheries guarantee 100 per cent safe arrival of the chicks. This is taken care of by including one or more extra chicks with each order to make up for any losses. The

customer is asked to count the live chicks, rather than the dead ones, to determine whether or not the number of chicks ordered have been delivered alive and in good condition.

Because the extra chicks included generally take care of any losses in shipment, many hatcherymen say nothing about replacements. Others ask the customer to make a claim, in the case of a loss, witnessed by a notary or by some prominent individual such as leading businessmen, school superintendent or pastor, returning the claim within 24 hours after the arrival of the chicks. The chicks are then replaced free. Postoffice rules do not permit the signing of these claims by postmasters or mail carriers.

Performance.—Because so many things can happen to chicks after they get into the customers' hands, guarantees with respect to the performance of the chicks or the matured stock are fraught with dangers. Many hatcherymen, however, do make guarantees of this type, apparently with success.

Livability.—An Iowa hatcheryman has a guarantee that his chicks will live two weeks. Those chicks that die from the first to seventh day are replaced free; those that die from the seventh to the tenth day are replaced at one-half the original cost; and those that die from the tenth day to the fourteenth day are replaced at two-thirds the original cost. The attested statement of the customer must be mailed to the hatcherymen not later than 20 days after the chicks are hatched. Replacements are made without protest, but should a customer ask for replacements three times, his name goes on the "blacklist." No more orders will be accepted from him.

Some hatcheries do not replace any chicks free under this guarantee, but make the replacements at half price. When the customer has to bear a part of the replacement expense, his responsibility is increased. In a guarantee of this type, it is best to have the customer submit his attested statement immediately after the expiration of the 14 day period. If the customer is permitted to make his report several weeks after the end of the period covered by the guarantee, his memory is apt to be hazy as to the exact number of the chicks lost up to the end of the fourteenth day.

An Ohio breeder-hatcheryman guaranteed 90 per cent livability for a period of three weeks on all chicks shipped before the last week of May. This date protected him against the excessive losses which

so often occur with late hatched chicks. All chick losses over 10 per cent were replaced free.

Quite different from the ordinary livability guarantee is this 60 day fire and windstorm guarantee made by an Illinois hatchery:

We guarantee Grade AA chicks and AAA specials against loss by fire or windstorm for a period of 60 days from date of delivery. We will replace free of charge 100 per cent of chicks lost by fire or windstorm. Loss to be reported immediately.

All claims for chicks must be sworn before a notary public, on blanks furnished on request by the hatchery. We will not answer claims made later than five days after the expiration of this guarantee.

Complete Satisfaction.—Guarantees as to full satisfaction are somewhat rare, but one of the most successful breeding farms and hatcheries in the East makes such a guarantee in addition to 100 per cent safe arrival and the claims concerning the parent stock:

We guarantee to give you full satisfaction with every order, large or small, that you place with us. If you are dissatisfied, or if anything goes wrong, write us. You will find us prompt in making full adjustments and that we justify the confidence of our customers.

No set form of settlement is offered, but each claim is treated as an individual case, the aim, of course, being to produce complete satisfaction.

PRICE APPEALS

Most people are price minded. While price undoubtedly ranks first among all selling appeals, many hatcherymen place an undue amount of emphasis on the price appeal, neglecting to supplement it with other appeals which add to the effectiveness of price.

Although every hatcheryman cannot offer low prices, he can use the price appeal in other forms.

Price Reductions.—If egg prices should break suddenly during the height of the hatching season, it may be necessary to lower chick prices. Prospects can be notified by letter that some of the savings made on hatching egg costs are being passed on to the buyer in the price of the chicks.

A very common method of indicating a general reduction in prices in catalogs and printed matter is to have the regular prices printed in black, but crossed out with lines printed in red and the new prices printed in red alongside of the old figures. Frequently, the price drop is announced on a sticker attached to the price list, the cus-

tomer being told to retain \$2 of the price quoted for each 100 chicks.

When a temporary surplus threatened a middle western hatchery, a letter went out announcing a special price in this manner:

I expect to have a slight surplus of best egg strain chicks on April 20th and April 27th as hatches are now running much better than expected, and I am going to make you a special proposition to ship as many best egg strain chicks as you desire on the above dates at the June prices.

Then followed a list of April and June prices with an explanation that the chicks from those hatches would be sold at June prices. Chick buyers were urged to wire their orders or to send them by special delivery letter. If already sold out when the order was received, the hatcheryman promised to notify the customer by special delivery letter.

Discounts.—Discounts are most often used as a special inducement to get the chick buyer to mail his order before a certain date. They may take the form of free chicks or a discount from the quoted prices. Examples:

If you place your order for chicks on or before February 1, we will allow you a discount of 2 cents a chick from prices quoted in our catalog.

10 Free Chicks With Each 100 Chicks If You Order Before March 1st.

If you order your chicks or hatching eggs by December 31, take 25% early order discount off these regular prices, and if you send payment in full with order, take off 5% additional cash discount.

An Ohio hatchery offering 10 free chicks used the lower part of the price list as a "free chick coupon" which had to be filled out by the customer when ordering chicks. An Iowa hatcheryman issued a "credit certificate" with much the same appearance as a bank check, crediting to the account of the bearer \$10 on an order of 500 chicks. This certificate had to be countersigned by the customer when ordering.

A Missouri hatchery used its discount to obtain the names of additional prospects. Chick buyers were given a discount of \$2 on each 100 chicks if they submitted the name of one chick raiser for each 100 chicks ordered.

An Iowa hatchery announced the following schedule of discounts in its efforts to secure advance orders:

Place your order for baby chicks at least 4 weeks or more ahead of your requested delivery date and deduct \$1.75 per 100 from the catalog prices. This is 1¾¢ per chick discount from any chick order amounting to 25 chicks or over. When you place your

order at least three weeks ahead of requested delivery date, deduct 1½¢ per chick from catalog prices and if you order 2 weeks ahead of the requested delivery date, deduct 1¢ per chick. Take discounts from either Grade No. 1 or Grade "A" prices.

Discounts have lost considerable effectiveness as a means of getting orders several months or weeks ahead of delivery, for usually there is no assurance to the customer that prices will not have dropped below what he paid by the time the chicks are shipped. A Missouri hatchery guaranteed its customers against any such loss by saying:

... you are insured against price declines. You can secure the shipping date you desire by sending only \$1.00 with any size order. Tell us when you want the chicks and we will ship them to you C. O. D. for the balance and charge you the lowest prices we are quoting at the time your shipment goes out.

Free Feed, etc.—Another form of price concession is the offer of free feed, feeding and drinking equipment, disinfectant for drinking water, glass substitutes, poultry books, poultry course, and similar items with each order of chicks. Many hatcheries make it a practice to give 10 pounds of chick starter with each order of 100 chicks. Besides helping to sell chicks, this plan gets customers in the habit of using a good starting feed.

Grades of Chicks.—The listing of several grades of chicks from which the buyer can make his choice may be properly classified as a price appeal. Nearly every hatcheryman will have some flocks that are better than others, and the breeder-hatcheryman who is doing pedigree work is bound to have.

There are various methods of establishing grades. Some flocks, because the foundation stock is better than usual or because the flock owner is a better manager, will rank higher than other flocks supplying hatching eggs. Flocks composed entirely of hens, likewise, are superior to pullet flocks, chiefly because of egg size. Blood testing is another basis for grades. The common practice is to base the grades on the quality of the males used.

Methods of designating grades are important. "Grade B" implies that the chicks are "seconds." Use terms which avoid any implication that the lower grades are inferior, for example:

AAA, AA, A.

Foundation "AA" Matings, Utility "A" Matings.

Super-Regal, Regal, Standard.

Master Breeding, Commercial.

Super-X, Super.

CHICKS ON CREDIT

While sales of chicks on credit should be avoided because of the element of risk, credit chick sales have become quite extensive in certain areas. Besides the hatcheryman, feed dealers, feed manufacturers, and lumber dealers in some sections have done considerable financing of poultry raisers.

Financing Plan.—A sound plan of selling chicks on credit would require (1) a down payment of one-third to one-half of the purchase price, (2) payment of the balance within 90 days, and (3) security in the form of a note which the bank will accept or a chattel mortgage on the chicks until payment in full is made.

When chicks are sold on credit, the usual plan is to increase the price to allow for financing, but sometimes the customer is required to pay one-half of 1 per cent interest per month. Monthly payments are required in some cases; in others, the balance need not be paid until the end of 90 days when the customer has had a chance to sell the cockerels.

The following is a sample of a conditional sales contract that may be used where the chick buyer gives a mortgage note to the hatchery in payment:

\$..... Blankville, Ind.,....., 19.....

On or before, 19..., for value received, I, we, or either of us, promise to pay to the order of Blankville Hatchery, at the First National Bank, of Blankville, Ind.,.....Dollars, with interest from date at the rate of 6 per cent, interest payable quarterly, and if interest be not paid or the poultry be not cared for, or the provisions of this contract be not complied with, then, the whole sum shall become immediately due and collectible at the option of the holder.

In case suit or action is instituted, or legal services required to collect this note, or enforce any of the provisions of this contract, I, we, or either of us, promise to pay all necessary costs and disbursements, including attorney's fees, that may be allowed or necessary in said proceedings.

The drawers, endorsers, grantors and sureties severally waive presentment for payment, protest, notice of protest and non-payment of this note, and hereby expressly agree to any extension of time for payment and for the payment of principal or interest in renewal hereof by any of the parties hereto.

The payments herein evidenced are understood and agreed to be for the purchase of

(comprising all poultry, of every kind and nature in possession or control or on the premises, or which may be kept on the premises or in possession or control of said vendee) in compliance with the provisions of this conditional sale contract. It is understood and agreed that the title to the said property is now in Blankville Hatchery, the vendor herein, and shall remain in said vendor and his assigns, until this note and the interest and all sums due thereon, including advances for feed for said poultry and all costs, shall have been paid in full, and the provisions of this contract fully carried out and completed.

It is hereby further fully understood and agreed that in case the conditional purchasers or vendees shall fail to take reasonable care of the property herein described, or to keep the same at all times properly fed, housed and cared for, and in a healthful and thrifty condition, or in case the market value of the same shall decline or shrink below the sum then due on this note and contract, the said vendor or his assigns, shall have the option and full right and power to declare this note and contract immediately due and payable, and if not paid, to take immediate possession of said property and feed and care for the same, sell, or cause the same to be sold, and the proceeds from such sale applied in payment upon this note and contract; and in case there is a balance due on said note and contract left unpaid, said vendees, drawers, endorsers, guarantors and sureties, jointly and severally undertake and agree to pay such balance upon demand.

It is further understood and agreed that the said property shall be kept and cared for by said vendees at their residence in
County of, State of and shall not be removed therefrom without authority in writing so to do by the said vendor or his assigns.

Executed in triplicate.

STATE..... }
County of..... } ss.

On this day of, in the year 19, before me, ...
....., a Notary Public in and for said State, personally appeared and
known to me to be the persons whose names are subscribed to the within instrument, and acknowledged to me that they executed the same in triplicate.

IN WITNESS WHEREOF, I have set my hand and affixed my official seal, the day and year in this certificate first above written.

.....
Notary Public for

(SEAL)

Residing at

Chicks on Shares.—Another credit plan is that of placing chicks with poultry raisers to be grown on shares. This plan is often used with 4-H club members and vocational agriculture students, but it has been used to quite an extent in some broiler areas and among turkey growers in the western states.

Share plans differ greatly. Usually, the grower supplies the labor,

housing and equipment, while the hatcheryman furnishes the chicks, fuel, litter, and feed, retaining title to the chicks until the chickens are sold for meat at the agreed age or weight.

One hatcheryman using the share plan gave 75 per cent of the net returns to the grower for his labor, the net return being considered that which remained after deducting the cost of chicks, feed, fuel, and litter from the gross returns.

Another plan is to guarantee the grower 5 or 10 per cent of the gross returns, depending upon conditions at the time, plus two-thirds of the net returns remaining after deducting the cost of chicks, feed, fuel, litter, and supplies.

Still another plan is for the hatcheryman to furnish the chicks, feed, fuel, litter, and supplies, paying the grower a specific amount for each bird, probably 10 cents, raised to 12 weeks of age.

Regardless of the share plan followed, good judgment must be used by the hatcheryman in choosing farmers with whom to grow chicks on shares. Housing and equipment should be such that brooding and rearing is not hazardous. In addition, the agreement between the hatchery operator and the farmer should be in writing. Here is a sample share agreement:

AGREEMENT

Agreement made this day of, 19....
between, of, of the first part, and
..... of the second part:

1. Party of the first part agrees to place with the party of the second part
.....chicks to be raised by the party of the second part for the party of the
first part under the following terms and conditions:

Party of the second part to raise chicks up to broilers or as soon as they buy them
on the market at top price (not less than 1¾ lbs.). Chicks may be sold and proceeds
equally divided, or party of the second part may retain one-half of the chicks upon
delivery to the party of the first part of an equal number. Party of the first part re-
tains the title, ownership and the right of possession of all the said chicks until chicks
are sold or divided.

Witnessed by

.....
.....

The above agreement could be improved by setting a definite date
on which the hatcheryman is to take possession of his share of the

chicks. When no date is specified, the customer may feel that the hatcheryman is not taking the chicks at the right time.

EASE OF ORDERING

Make it just as easy as possible for the customer to place his order. The chick raiser may be told:

10 per cent down will book your order.

1 cent per chick books order.

One-fifth deposit will book your order.

\$1 down per 100 chicks books your order.

Many hatcheries require payment of the balance 10 days before shipping; others C. O. D.

CUSTOM HATCHING

Convenience, economy and proper conditions for incubation of eggs should be stressed in seeking custom hatching business. This is the type of catalog copy an Iowa hatchery used:

We are fully equipped to do your hatching. We can do your hatching cheaper than you can afford to do it yourself. A great many poultry raisers have flocks of good breeding they wish to get chicks from, and we are glad to do it.

Our incubator capacity is large enough so you can bring them to us and have them hatched at low cost. It means a lot of time and trouble saved, besides the liability of loss in hatching if you did it yourself. With our expert knowledge of incubation, and spending our entire time of watching the eggs 24 hours of the day, you may be assured of a good hatch.

You are assured of getting your own chicks, as we use a double checking system for all custom hatching. After the chicks are hatched, they are put in boxes and given proper care to avoid chilling, overheating and crowding. We will notify you when chicks are ready, or will ship them to you.

We guarantee to hatch 75 per cent or more of all fertile eggs. Our expert knowledge of incubation enables us to make this Iron Clad Guarantee. You will receive a good stout chick from the fertile eggs. I want you to be assured of getting a square deal. My past and future reputation depends on your satisfaction.

STARTED CHICKS

The advantages of 3 weeks old chicks started in modern, up-to-date battery brooders are very well covered in this description which appeared in the catalog of a New York poultry farm:

The temperature, moisture, and ventilation are all absolutely controlled, resulting in better grown, sturdier chicks than can be grown under brooder stoves.

There are many advantages gained by growing chicks in Battery Brooders. Chicks are on wire bottom trays and water and feed is on the outside making it impossible to contaminate it.

Battery grown chicks are free from disease and are by the critical age when you receive them.

You save three weeks time and labor, fuel, and feed. No more constant care for those first few days. You have your chicks all the same size at three weeks. No culls or poorly grown chicks.

Started chicks need less heat. No more sitting up nights to watch your brooder fire.

There is a growing demand for started chicks. Once customers have tried them and found how it simplifies their brooding troubles they want only started chicks.

Then, lest the customer be unfamiliar with the methods of handling of started chicks, the following suggestions are offered:

Three weeks old chicks received any time before May 20th still need artificial heat. They must be kept comfortable. Also put a chick guard around your brooder, the first two days, the same as for day-olds. Give them plenty of feed in hoppers before them all the time so they will not eat litter.

MISCELLANEOUS APPEALS

Free Toe Punch Service.—Upon request, an Illinois hatchery will toe punch 25 per cent of the customer's chick order from an unrelated flock from which the customer can save his next year's cockerels.

Wing Banded Chicks With Order.—An Indiana breeder-hatcherywoman included five wing banded chicks from her special matings of hens having records from 200 to 230 eggs with each 100 Grade-A chicks. She explained that the customer could mate males from these wing banded chicks with Grade-A pullets or hens of the same year or of the previous year.

Free Pedigree Certificate.—Some breeders send free pedigree certificates to customers ordering chicks, hatching eggs, or grown stock from special matings.

Free Service.—Many beginners go into the poultry business each year. To them an offer such as this made by an Ohio hatchery may serve as an added inducement to get them to place their orders:

We give our customers the benefit of all our experience in the poultry business. We not only give you chicks which have had our most careful attention, but we also give our customers all possible help in raising their chicks. If you buy from us, we will gladly advise as to care, feeding methods and on all other points having to do with successful chick raising. Write to us if you have had a poultry problem that puzzles you. We will do our very best to help you.

Breed Characteristics.—Most poultry raisers have pretty well formed opinions as to what they desire in a breed of poultry. When they select a breed or variety, they may be influenced by its plumage characteristics, ease of breeding, egg laying ability, egg color, meat qualities, weights, feed consumption, housing space required, rate of feathering, earliness of maturity, adaptability for special purposes as broilers, etc.

While egg color, shank color, amount of housing space required are qualities that will run pretty uniform, many of these characteristics will vary with the strain, and these differences should, of course, be pointed out. Barred Rocks have been poor on feathering, but many breeders have succeeded in overcoming this undesirable characteristic.

Contests.—Besides serving as an incentive to chick raisers to send their orders, the contest offers a means of securing worth while testimonials from customers for use in the hatchery advertising literature.

An Illinois hatchery offered \$500 in 45 cash prizes in a chick growing contest open to the customers purchasing 100 or more chicks. Prizes were awarded on the basis of the customer's success, clearness and completeness of description, and reasons to which the customer ascribed his success. An Iowa hatchery staged a similar contest and offered brooder houses, brooder stoves, equipment, and chicks as prizes.

Slogan and photo contests are other possibilities. Suggestions for window contests will be found in the chapter on window displays.

Crossbred Chicks.—More rapid growth, increased egg production, and high livability of chicks are the chief advantages of crossbred chicks. With the sex-linked crosses, there is the added advantage of being able to obtain all females or all males because sexes can be distinguished at hatching time.

XX

BUILDING THE ADVERTISEMENT.

EVERY HATCHERY advertisement that attempts to sell baby chicks by mail is expected to do the following things:

1. Catch the attention of the reader. Blackness of the headline or an attractive illustration may catch the eye of the reader, or it may be some unusual border or striking arrangement of the ad.

2. Interest him to the point of reading it. This job will fall largely to the headline.

3. Make him want to buy of the hatchery. This is where good copy counts.

4. Cause the reader to respond by ordering chicks or by writing for additional information in the form of the catalog.

Not every ad that is run by a hatchery can be expected to produce results, but continued advertising over a period of several months should result in sales. If it does not, it may be because the advertising is reaching the wrong audience, or it may be that the individual advertisements are falling down on one or more of the four steps outlined above.

The Headline.—The purpose of the headline is to attract favorable attention and to induce further reading of the advertisement. Short headlines of four or five words are more readily grasped and understood than those consisting of 10 or more words. Use short, familiar words. Say something that will make the reader want to go beyond the headline to get the rest of the message.

Headlines in many hatchery advertisements are weak. They lack action and say little about the chicks. For example:

Jones Single Comb White Leghorns
Oak Ridge Poultry Farm
Stevenson's Baby Chicks

These headlines tell nothing about the quality of the chicks, nor do they tell the reader how he can benefit by the purchase of chicks

from these hatcheries. The first headline has some merit, especially if small space is being used. It will, at least, get the attention of those readers who want Leghorn chicks and who are studying the ads of those hatcheries and breeders offering this variety.

To give action to headlines, use verbs where possible. Put the



• Quality eggs bring top market prices. Kerr's Lively Chicks are **BRED** to lay generous-size eggs—early and often. They pay their way with a greater lay.

This "egg-ability" is the result of a 38-year-old breeding program. 240-acre breeding farm. 120,000 breeders blood-tested every year for B.W.D. (pullorum) by slow tube agglutination method. We guarantee 100% live delivery. Advance orders receive special discount.

Free Poultry Raisers' Guide and list of prices will be sent upon request . . . or call at your local branch office.



N.Y.: East Syracuse, Kingston, Binghamton, Middletown, Schenectady; **CONN.**: Danbury; N. J.: Paterson, Jamesburg, Woodbury; **PENNA.**: Lancaster, Dunmore, Reading. (Dept. 15.)

15 RAILROAD AVE., FRENCHTOWN, N. J.

Kerr Chickeries



"We Kerr Chicks cost only a penny or two more than ordinary chicks. Worth it? You bet! We lively chicks soon lay more and larger eggs . . . plump up quickly for broilers and roasters. Quick—and big—profits for you!"

The Kerr strain of superior chicks for 38 years has been bred from flocks that are layers, not loafers. 240-acre breeding farm. 120,000 breeders are blood-tested annually for B.W.D. (pullorum) by slow tube agglutination method.

Guaranteed 100% live delivery. Reputation for fair dealings. Advance order discount. Free Poultry Raisers' Guide, price list.



N.Y.: East Syracuse, Kingston, Binghamton, Middletown, Schenectady; **CONN.**: Danbury; N. J.: Paterson, Jamesburg, Woodbury; **PENNA.**: Lancaster, Dunmore. (Dept. 15.)

15 RAILROAD AVE., FRENCHTOWN, N. J.

Kerr Chickeries

Fig. 113.—Where possible, the headline should emphasize some particular appeal. While these advertisements follow a certain style, the headings, illustrations, and copy are changed each month.

main appeal right into the headline, and build the rest of the advertisement around it. These headlines contain action:

Buy Hen-Bred Chicks—Gather More Large Eggs.
This year . . . Buy BALANCED BREEDING.
You'll Get More Eggs and Make More Money with GASSON STRAIN.
Creighton Brothers Leghorns Will Make Money on Your Farm.
Babcock's Healthy Chicks Make Great Layers.
Why Buy Chicks Blindfolded?

While some of these examples are a trifle long, they can be kept from appearing too long and monotonous by setting certain portions in different sizes or styles of type for emphasis.

Writing Copy.—The following rules in writing advertising copy appeared in *Small Store Advertising*, a booklet published by the Chamber of Commerce of the United States. These rules were handed down by John H. Patterson, founder of the National Cash Register Company:

1. Know your subject.
2. Use short words.
3. Write short sentences.
4. Make paragraphs short.
5. Use big ideas.
6. Put only one thought in each sentence.
7. Write so that a child will understand.
8. Say precisely what you mean.
9. Be brief.
10. Be logical.
11. Tell the truth.
12. Never exaggerate.
13. Don't imitate.
14. Be enthusiastic.
15. Write to impress the reader, not to express yourself or impress a competitor.

Repetition.—One of the most important principles to observe in writing mail order copy is repetition. Repeat the same thing a number of times and say it in several different ways, so that the reader will be sure to understand. One successful chick merchandiser who features "winter layers" repeated these two words four times in a small ad, and much of the remainder of the copy emphasized the high records which birds of his strain had made. This constant repetition over a period of years has identified this hatcheryman as the source of "winter layers."

Variety of Appeals.—While most successful chick advertisers try to build their advertisements around some central idea, they

Fast, even growth.

More eggs per pound of feed.

Quicker broilers and fryers.

Supervision by state department of agriculture.

R. O. P. sired chicks.

Reports from three customers on laying results.

Sexed day-old pullets and cockerels.

Three superior crossbreds.

Special broiler values.

\$11,739.77 spent to get R. O. P. breeding sires and hatching eggs to improve chicks.

Be Specific.—Vagueness and the use of generalities are weaknesses of much hatchery advertising copy. Frequently, the copy is just a mass of words put together in a form that they read smoothly. Make everything clear. Here is some copy which does just that by citing definite figures:

Contest records! Sure we like to win them. World Record Red pen, high all breeds Penna. contest 1942, 3836 eggs, 4089.7 points. Highest six-year Red R. O. P. average in U. S.—257 eggs per bird—Highest heavy breed Livability Achievement Award competition for three years. These and many others mean that here are all the profit building qualities highly developed for you.

Generalities such as “Our breeders are of the finest trapnest-pedigree quality from official contest winning strains,” do not mean as much to the reader as “Last year our flocks averaged 183 eggs per bird—average on a total of 2,790 birds,” or “Our White Leghorn pen at Storrs averaged better than 273 eggs.”

Paint Word Pictures.—In selling chicks by mail, a hatcheryman is somewhat at a disadvantage. He cannot show the chicks to the customer to prove that they are strong and active. But he can describe the chicks with the aid of photographs and by painting word pictures. A word picture is an image created in the reader's mind through a collection of descriptive words. Nouns and verbs may be used to paint word pictures, but more often the brunt of the burden falls upon adjectives. For example:

When a poultryman receives his order of Skookum Chix and opens the boxes, he likes their vigorous appearance—they look strong and husky. There is an abundance of rich color; there's the snappy, beady, black eyes; sturdy shanks—when they're handled they have a wiggle and kick that means vigor—and they're just *ra-rin'* to go.

Avoid the use of superlatives as “best,” “greatest,” and others. They weaken the message, often raising doubts in the reader's mind.

Quoting Prices.—It takes a lot more effort to sell 18-cent chicks

than it does to sell 6-cent chicks. Attempts to sell high priced chicks direct from the advertisement generally are unsuccessful.

The ordinary hatchery advertisement in a poultry journal or farm paper usually does not contain space enough for the additional explanation needed to convince a poultry raiser that he will be ahead by purchasing 18-cent chicks instead of 6-cent chicks advertised in the same publication. For this reason, the most successful merchandisers of high grade chicks put forth every possible effort in their publication advertising to draw inquiries. These inquiries are then followed up with the catalog and other literature containing the complete sales story.

Make the Reader Act.—To produce business, every mail order advertisement must make some effort to get the reader to respond. It may invite him to "order direct from this ad," or urge him to "Send for free catalog." Except when the main appeal in the advertisement is built around getting the reader to send for the catalog or booklet, this appeal is placed last in the copy, preceding the name and address of the advertiser. This is how hatcherymen invite a response:

Free! . . . This book tells the PROFITABLE WAY under today's conditions.

Send for free combination Poultry Handbook and catalog today.

Write today for free folder and early order discounts.

Write for price list and free copy of Poultry Raisers' Guide.

Send postcard for catalog.

Write for price list and *Chick Chats*, a free, helpful magazine by E. R. Wells.

40-page 4-color poultry book free.

Order from this ad. \$1 books order.

Catalogs that have interesting titles such as "The Story of Jones' White Rocks," "How to Get More Winter Eggs," "Smith's Chick Brooding Secrets," and similar ones usually bring a greater response than simply "catalog." The title, of course, should be a true indication of what will be found in the catalog.

If the catalog is free, say so. It will dismiss any doubt.

When the advertisement covers a page, two full columns, or a single full column, the use of a coupon usually increases the returns. The use of coupons in smaller sized ads is not recommended, for the coupon is just as likely to appear somewhere in the middle of the page where it is difficult to cut out. Keep the coupons near the outer margins.

Typography and Layout.—The subject of advertising layout and typography covers such a vast field that it is possible here to treat it only, in a very limited way.

Choose familiar, easy-to-read type faces. Extremely modern, unfamiliar types should be avoided. Several lines of type set in all capitals are usually difficult to read. Use capitals and lower case, but if certain words are to be emphasized, they may be set in caps, in blacker type, or in italics.

Follow the same principles in choosing headline types. If the headlines are to be hand lettered, stick to the simple styles of lettering and avoid fanciful ornamentation. Sometimes headlines can be made to stand out more prominently by making a reverse etching, so that the letters appear white on a black background.

If the advertisement is to lead the reader through the four steps mentioned at the beginning of this chapter, the headline, illustration, body type, and signature or name and address should be arranged in proper order. Either the illustration or the headline may be placed at the top of the advertisement, but if the headline comes first, the illustration should be placed to one side beneath the headline. By setting body type either to the right or left of the illustration, the headline will lead directly to the text matter, thus preventing the advertisement from being cut in two.

Place the illustration so that it faces into the advertisement. For example, if a running chick is the illustration, have it running into the advertisement rather than into the one next to it or off into space.

Some advertisements look quite “dead”; others seem to sparkle with life. The secret lies in having contrast between various elements of the advertisement. If the headline or the illustration is quite black, use a light face type for the body matter. Frequent use of bold face subheads helps to break the monotony. The setting of certain words or groups of words in blacker type, in capitals, or in italics, likewise, will put more “snap” into the text matter.

Users of large space sometimes find it quite an advantage to use an extra color. It is well to keep in mind that the printing of type in color, unless the type face is unusually heavy and the color quite dark, usually makes the type harder to read. Never set body matter

in color. Color is most effective when it is used for ornaments, borders, and for backgrounds for type and illustrations.

Results from mail order advertising are accumulative. If the advertiser can make his name more familiar to the readers of a publication, his chances of getting those readers to respond are greatly increased. If, however, his advertisements are so completely changed each month that they bear no resemblance whatever to the

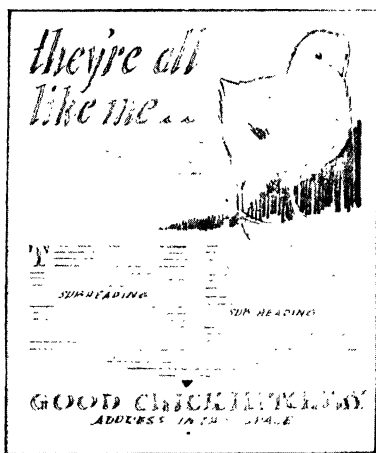


Fig. 115.—A rough sketch or layout of the advertisement serves as a working plan for the printer.

previous one, it is difficult to do this. Continuity may be obtained by the use of a trademark, the same family of type, the same borders, the same style of lettering for the signature, and a characteristic style of illustration. One or several of these things, in addition to the arrangement, can be changed at a time without causing a break in continuity.

Making the Layout.—If the advertisement is sent direct to the publication in which it is to appear instead of being handled through an advertising agency, the copy should be accompanied by a sketch or layout indicating the general effect which is desired in the completed advertisement.

Lay out on a sheet of paper the size and shape which the advertisement is to occupy. Indicate the position and size of the display types by lettering them in the layout about as heavy as the type desired. The position of the illustrations can be indicated by pasting

KERR CHICKS LIVE
Our 36 years of fair dealing insure satisfaction. Hatches weekly. Write for prices.
KERR CHICKERIES
3 Railroad Ave., Freehold, N. J.

REDUCED SUMMER PRICES WENE CHICKS
Leading pair of Gamebirds, Bantams, etc. R.O.P. approved, blood-tested. Hatches weekly year around. Catalog FREE.
WENE CHICK FARMS, Box J-S VINELAND, N. J.

ALGER "Golden Hamps"
IMPROVED NEW HAMPSHIRE
Mars. U.S. Pullorum Clean
Our Chicks won SWEEPSTAKES at 1944 Boston Poultry Show. Let us supply chicks of the same breeding. Free Folder and Price List
ALGER FARMS
Box 10, Breckton 3, Mass.

PARKS BARRED ROCKS
Barred Rock Specialists since 1889. Better breeding bird examined, approved, and banded by State Inspectors. Breeding backed by 34 years experience. B.O.P. supervision and Contest performance. Eggs — Chicks — Breeding Males New. Reserve 1944 orders early. Catalog free.
ONE BREED ONLY **JOE PARKS & SONS, ALTOONA, PA.** **WORLD'S OLDEST STRAIN**

HELM'S Egg-Line CHICKS
IMPROVED FOR YEARS With 200-322 Egg ROP And Trapnest Stock
Famous pedigreed strains. All U. S. Approved. Pullorum Tested. Customers report wonderful livability and egg production. Reasonable former chick prices.
FOUR WORLD RECORDS U. S. Egg Laying Contests
—and a total of 1052 official awards won for high egg production. We offer you chicks from same matings that produced these winners.
FREE — 36-page catalog contains complete facts. Every poultry raiser should have it. Write today.
ILLINOIS HATCHERY, Box 4, Metropolis, Ill.

The Business Breed at Its Best MOUL'S NEW HAMPSHIRE
Product of 30 years progressive breeding. Outstanding in growth, livability and high average production. Can't be beat for eggs or broiler parents or for stock improvement. Write today for descriptive catalog.
MOUL'S Brentwood Poultry Farm, Box E, Exeter, N.H.

STEP UP YOUR BREEDING FLOCKS
Fortify your flocks with performance-proved Holtzapple Victory Gamebirds. Write for information.
HOLTZAPPLE POULTRY FARM
Box 89 Elida, Ohio
HOLTZAPPLE WHITE
U. S. Certified and R.O.P. **ROCKS**

Fig. 116.—Examples of effective typography and layout in small space. Distinctive headings and borders along with proper choice of type to emphasize certain words can make the small hatchery advertisement stand out among others on the same page.

a proof of the cut on the layout or by making a rough outline or sketch of the space which it is to occupy. The weight of the borders can be indicated with pencil lines drawn as lightly or heavily as wanted. Straight lines can be drawn in the space or spaces left for body type.

Small Space Advertisements.—Small space advertisements start

with a handicap. They must compete with other small advertisements as well as larger ones on the same page. Larger advertisements give a greater opportunity to inject art and cleverness into the headline.

To make small space copy stand out and prevent it from being over-shadowed by its larger competitors, drawings, cuts, special borders, type, illustrations, and even white space can be used to make the advertisement distinctive.

Newspaper Advertisements.—The principles which apply in the preparation of mail order advertisements apply in the main to newspaper advertisements. The newspaper ad should go through those same steps of attracting attention, arousing interest, creating a desire, and getting the reader to act. Instead of asking the reader to send for the catalog or circular, invite him either to call at the hatchery or to use the phone. This means, of course, that the newspaper ad should include the street address and the telephone number of the hatchery.

Unless advertising is being carried in a number of newspapers in the immediate territory, special artwork is likely to be out of the question, but newspaper ads can be "snapped up" considerably by the use of stock cuts of baby chicks and layers, the hatchery trademark, and association emblems. Most local newspaper plants have a service which enables them to supply stock illustrations of chicks.

There is a tendency for much of the hatchery advertising appearing in country weeklies to be rather deficient in selling points. Many hatcherymen are content merely to list the breeds and varieties handled together with prices. Copy that has a definite appeal will do a much better job of selling. The use of testimonials containing definite figures from farm folks known in the community certainly would put a lot more "punch" into newspaper advertisements.

Usually, it is best to quote prices in the ad, but if there is price competition in the immediate territory, all efforts in the newspaper advertising should be directed toward getting the prospect to visit or phone the hatchery.

A number of hatcherymen have had particularly good success with running their local newspaper advertising in the form of a weekly poultry column under some such heading as "Chick Chats," "Poultry Pointers," or something similar. Short factful paragraphs

containing seasonable tips on brooding and flock management are sandwiched in between items about the hatches that are coming off, experiences of customers, methods of disinfecting incubators, prices, etc. If written in a friendly, chatty style, such a column is likely to be read with as much regularity as the "personals."

What is Classified Advertising?—Classified advertising is one of the most effective and economical forms of advertising for the small hatchery. Even those hatcheries that use considerable display advertising supplement this with classified advertisements because of their appeal to a certain group of readers.

Classified advertisements usually are set in small type of uniform size and style and do not contain illustrations. While the display ads depend upon a variety of sizes and styles of type, illustrations and borders to attract the buyer, classified ads do not rely upon any of these attention getting devices, for classified ads are sought for by readers who have a reasonably good idea as to what they want.

Since the classified ad is simply an announcement of an offer appearing under a heading followed by similar offers, it is easy to find. Country weekly newspapers, however, often throw all classified ads into one or more columns without any attempt to classify the offers. City newspapers usually group all poultry and chicks advertising under a heading like "Poultry, Chicks and Pet Stock," while farm papers and poultry publications have detailed classifications according to breed and variety. Thus, if a poultry magazine reader wishes to obtain Barred Plymouth Rocks, all he has to do is to turn to the classified ad section and look at the offers under the heading, "Barred Plymouth Rocks."

How to Write Classified Ads.—"The more you tell, the quicker you sell," is the slogan and suggestion of the *Chicago Tribune* classified ad department. Too often, there is a tendency to skimp on words in writing the hatchery classified ad. As a result, the reader fails to get a clear idea as to what the advertiser has to offer; so he passes on to another ad. Here, for example, is an ad which is merely a bare listing; it tells nothing about the quality of the stock:

BARRED Plymouth Rock pullets, hatching
eggs, certified chicks. Catalog free. Blank
Farms, Box 21, Blanktown, Ind.

If you want your prospects to get a clear idea of what you have to offer, you can't be stingy with words. Before writing a classified ad, list all those qualities and characteristics that make your chicks outstanding. What kind of egg records have the parent stock made? Do you breed for large egg size? Is your stock healthy? These are things that your prospects want to know. Be specific. Observe how well the following ads tell their story:

CRAYDEN'S STERLING quality chicks give you proved profit-making ability. From U. S. Approved-Pullorum. Controlled, selected hand-culled flocks, backed by eighteen years breeding experience. R.O.P. sired matings available. 10 leading breeds. Reasonable prices on sexed (95% accuracy guaranteed) or straight-run chicks. Write for Free Catalog. Sterling Hatchery, Box 7-C, Ramsey, Indiana.

AUSTRA-WHITE COCKERELS weigh $2\frac{1}{4}$ pounds in eight weeks. Have plump heavy body. Develop faster, healthier, high livability. 30,000 satisfied customers. Berry's Breeding farm headquarters 55,000 super deluxe Leghorn hens mated with pedigreed Austra-lorp males. Hens average $6\frac{1}{2}$ pounds. Equals Leghorn in laying. Write for catalog, low chick prices. Berry's Sunflower Hatchery, Newton, Kansas.

XXI

MAIL ADVERTISING

MAIL ADVERTISING, or direct-mail, consists of typewritten letters, imitation typewritten letters, and various printed matters such as catalogs, booklets, broadsides, postcards, and similar matter sent through the mail.

Many hatcheries could make their direct-mail efforts a lot more productive. Most of the wastes in direct-mail are due to (1) poor paper stock in appearance, (2) weak presentation of selling appeals, (3) poor mailing lists, and (4) lack of a follow up system.

The Mailing List.—An ideal mailing list is one made up of an accurate list of names and addresses of prospective chick buyers located in the hatchery's selling territory. Names for the hatchery mailing list may be secured through:

1. Advertisements in poultry and farm publications which get the poultry raiser to write for further information.

2. Present customers who may be asked to furnish the names of additional prospects. Some hatcheries provide a space for names on the back of the order blank. An Iowa hatcheryman included a stamped postcard with each shipment, so that the customer could report the condition of the chicks on arrival. From the prospects secured in response to his request for the names and addresses of "three friends who might be interested in buying baby chicks," he developed \$1,500 worth of business. A Missouri hatchery offered a discount on chick prices for the name and address of one poultry raiser for each 100 chicks ordered.

3. Purchase of commercial mailing lists consisting of names of prospects secured by other hatcheries in previous years. When the names are classified according to breed preferences, the list becomes more valuable.

4. Membership lists of poultry and breed associations.

5. Contests at state and county fair exhibits.

Another method of reaching prospects, but a less selective one, is to address all boxholders on the rural routes reaching out of your town. Your local postmaster will tell you how this can be done.

Keep your mailing list up to date. This applies to both the customer and the prospect sections of the list. Many of the successful mail order hatcheries discard names of people who fail to respond or order chicks after a period of three years. One way to maintain an accurate list is to send out a first class letter once a year, or send out at least one mailing under the third class rate, guaranteeing return postage if undeliverable. Catalogs should always go out with the guarantee of return postage, for most catalogs are worth many times more than the postage necessary to get them back if the addressee cannot be located.

If regular followup mailings are to be made to the list, it is advisable to invest in addressing equipment, so that the names can be placed on address plates or stencils. When the list is plated, it is possible to get out a mailing more quickly, should the need arise, than with typewriter or longhand addressing.

Use extreme care in putting names on the mailing list. No one likes to receive mail with his initials incorrect or his name misspelled.

Persistency Brings Results.—One of the main principles in mail advertising is persistency. Don't rely entirely upon one mailing piece to bring the order. Repetition is required to break down indifference.

In a *Hatchery Tribune* survey of 124 advertising campaigns of hatcheries doing a mail order business, it was found that 44 per cent of the hatcheries depended upon the first letter, catalog or circular sent out in response to the inquiry, to land the order. Something like 17 per cent had one follow up, 21 per cent had two follow ups, 10 per cent had three, while the remaining 8 per cent had from four to six. The significant thing about this survey was the fact that those hatcheries generally considered most successful had from three to six follow ups.

Number of Follow Ups.—The average hatchery mailing campaign should consist of one main piece with at least three follow ups. If higher than average prices are being asked, more follow ups are usually required to get the order. Don't put all of the mail advertising appropriation into an elaborate catalog. A campaign consisting of

a broadside and several folders or letters is likely to do a better job of selling than a "campaign" consisting only of a catalog.

Frequency.—Send the follow up material at intervals of one or two weeks. This will give the prospect plenty of time to think about your proposition, yet not enough time to forget that you are seeking his order. If he doesn't respond to your regular follow up system, let him have your special offers whenever you make them. •

Vary the Form.—Changing the form of the follow up creates new interest on the part of the prospect. If a broadside is used for one follow up, try a letter, mailing card or a broadside of a different size for the next one. Even the use of a new style envelope will awaken the reader's interest.

Vary the Appeals.—If the prospect cannot make up his mind to order, a variation in the appeal may move him to act. The follow up could be built around price, but it could just as well point out why it is safest to buy good chicks instead of cheaper stock. If you want to stress some one selling appeal in all your advertising, dress it up and approach it from a different angle.

THE CATALOG

The catalog is probably the most important mailing piece in the selling campaigns of most mail order hatcheries. Often, all other selling efforts are built around it.

If the catalog is to do a good job of selling chicks, naturally it must contain all the elements of a complete sales appeal. It should look inviting, it should tell the complete sales story and back it up with proof, and it should make it easy for the prospect to order.

The Catalog Cover.—Make the cover look so interesting that the poultry raiser will want to know immediately what is inside. Have a title which will arouse his interest. Use an illustration that visualizes some strong selling point.

The cover of a midwestern hatchery catalog showed a woman gathering eggs. A breeder of New Hampshires featured a large picture of a basket of eggs on his catalog cover. A Connecticut hatchery used a picture of two chicks in natural color against a background of eggs, while a Pacific Coast breeder built his catalog cover around a striking air view of his farm.

Writing Catalog Copy.—Before attempting to write your catalog, study your sales appeals. Refer to Chapter XIX for ideas. What is your strongest appeal? How much space do you want to devote to it? What are your secondary appeals?

Actual writing of copy for a catalog is not a whole lot different than the writing of copy for a publication advertisement, but the

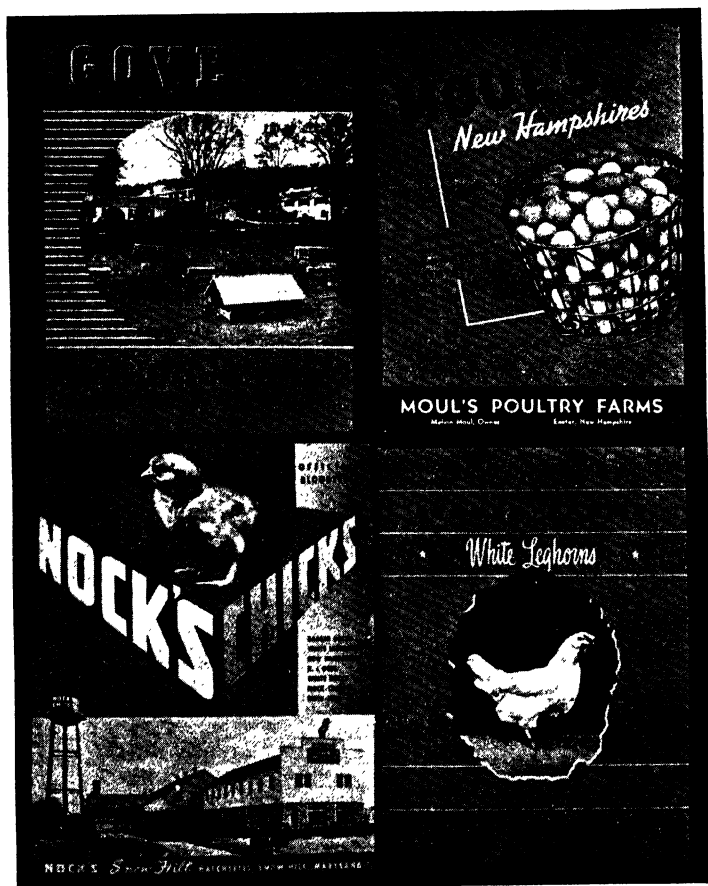


Fig. 117.—Catalog covers should arouse the curiosity of the prospective chick buyer and cause him to read the catalog.

catalog permits greater detail in telling the sales story. Those points brought out in Chapter XX on the writing of headlines and copy apply here also.

Don't take too much for granted. Give detailed, clear explanations which will give the prospect a clear idea of what you have to offer and how he can gain by purchasing your chicks. Be specific. Use figures to substantiate your statements. Create confidence by using testimonials from your customers. One Ohio hatchery gave the number of chicks purchased annually over a period of years by those chick buyers who re-ordered large quantities of chicks year after year. A Pennsylvania breeder for many years has reproduced typical customer reports of the mortality of the chicks up to three weeks of age to prove high chick livability.

If you have a good selling point, don't fail to repeat it throughout the catalog. Repetition is necessary in selling by mail.

Make it easy for the customer to order by including an order blank with the catalog or, for that matter, with any piece of direct mail advertising that leaves the hatchery. Make the order blank so simple and clear that it will be easy to fill out. It should include a space for the name and address, number of chicks, variety of chicks, total purchase price, amount sent with order, amount due, date of shipment desired, and second choice variety.

The four-page price list and order blank is quite popular. The first two pages are used to describe the matings and list the prices, while page three has the order form. Page four may carry the guarantee, something about early order discounts, or space where the customer can list names of friends who might be interested in receiving the catalog or literature. By having the sheet perforated, the customer can retain the first and second pages when sending in his order.

Illustrations.—An old Chinese proverb says "one picture is worth a thousand words." Make each illustration that you use tell a story about your chicks. Show pictures of your chicks, foundation flocks, and various steps in the breeding and production of your chicks. Use pictures of your customers and their flocks. A photo contest during the fall months will help to secure good pictures. Put your camera to work when you visit nearby customers.

Don't use pictures that are poorly taken. Also avoid the mistake

of reproducing photographs in such small size that most of the detail is lost. The popularity of picture magazines has been reflected in the use of larger photographic illustrations in most hatchery catalogs in recent years.

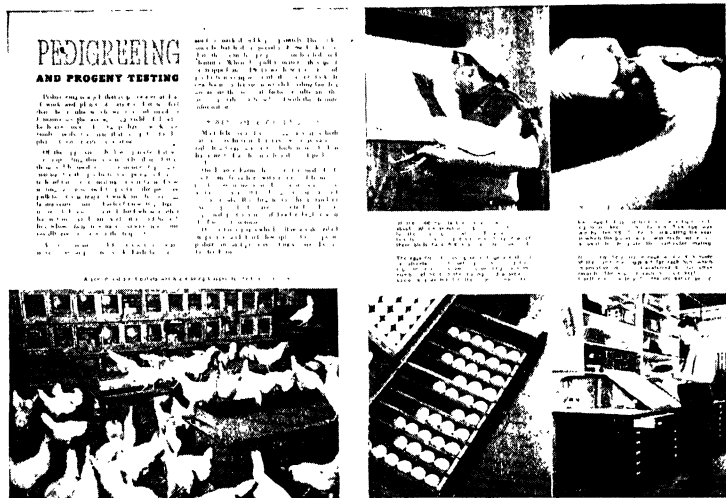


Fig. 118.—Effective use of photographs to tell the story back of the chicks that are being offered. Seven additional pictures are used to explain the steps in pedigreeing.

Mechanical Features.—Size is one of the first things to determine when planning a catalog. If a page size of $8\frac{1}{2}$ by 11 inches or 9 by 12 inches is preferred, the catalog should contain not less than 16 pages, and then it should be printed on a heavy weight of stock. Catalogs with few pages and printed on lightweight paper are apt to be damaged considerably in the mail. Some hatcherymen use catalogs with 6 by 9-inch pages, but this size has become less popular with the trend toward the use of large illustrations.

Considerable expense can be avoided by making the number of pages in the catalog some multiple of eight. Thus, if the catalog is to contain more than eight pages, it should have 16, 24, 32, 40, 48, etc., for the number of pages. Special presswork and binding is necessary with two and four page forms. Four page forms, however,

are necessary when the cover is to be of a different grade of paper than the body of the catalog.

Most hatchery catalogs will contain a large number of halftones, or photographic illustrations. They will show up best on paper having a smooth finish. Enamel papers give the best results for halftone reproductions, super papers next, and good grades of English finish papers rank third.

When enamel papers are used, employ a rather even toned type face for the body matter. The type face used for the text matter in this book would be entirely suitable, but even darker appearing faces are sometimes desirable.

Variety in the headline arrangement and page layouts lends interest to the pages of the catalog and keeps them from becoming monotonous. Vary the size of the illustrations and their relative position on the different pages. Use plenty of subheads to keep the pages from taking on a "dead" appearance.

Prolonging the Catalog's Life.—When a poultry raiser receives a large number of hatchery catalogs, it is likely that some of these catalogs will find their way into the waste basket very shortly. One method of adding to the life of the catalog is to include some directions on the brooding of chicks and possibly the management of layers. These directions should be presented in a simple, easy-to-understand manner.

Four pages in the catalog of a New York poultry farm were devoted to poultry suggestions grouped under the following subheadings:

- What to do before your chicks arrive.
- What to do when chicks arrive.
- Number of feeders and water pans to use.
- What to feed chicks.
- Management of growing chicks.
- Don't overcrowd chicks.
- How to control and prevent coccidiosis.
- Housing the laying birds.
- Feeding laying birds.
- Keep records on your poultry.
- Chick diseases.
- Diseases and parasites of mature birds.

BROADSIDES, FOLDERS, MAILING CARDS

A broadside is really a form of circular which attempts to deliver a "smash" message. It consists of one sheet folded several times with the address placed directly on the broadside. Usually it is built around one main selling point which is emphasized rather strongly, while other appeals are subordinated. In this form, the broadside is used principally as a follow up piece, but the broadside is often used in place of a catalog.

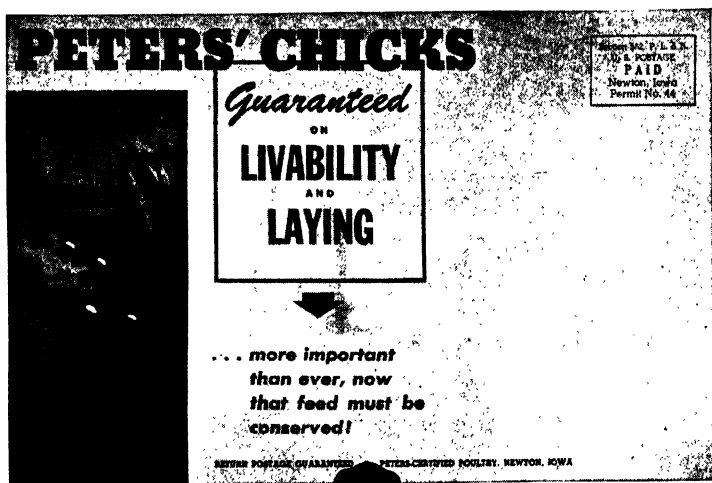


Fig. 119.—Address side of a four-color broadside which measures only 6 by 9 inches when folded, but opens up to a sheet 18 by 24 inches.

In choosing the size, do not make the broadside so large that it is awkward to handle. One of the most popular sizes of broadsides measures 17 by 22 inches when completely open and $5\frac{1}{2}$ by $8\frac{1}{2}$ inches when folded three times. Another popular size measures 11 by 17 inches when open and approximately $3\frac{1}{2}$ by $8\frac{1}{2}$ inches when folded.

Use the outside fold to entice the reader within, and the succeeding folds to tell your story in proper order. Strong type, large il-

illustrations, and color add to the vigor and effectiveness of the broadside. Don't lose sight of orderliness and good taste, however.

Letter Folders.—One of the best forms of direct-mail advertising for a hatchery having a limited advertising appropriation is the four-page folder, the size of a regular letter sheet, with the first page containing the hatchery's letterhead. The other three pages are used for the regular selling message.

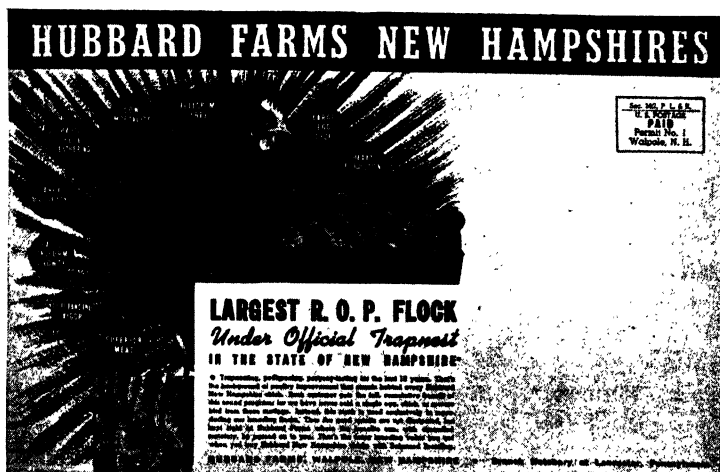


Fig. 120.—The face of a mailing card, 7 by 10¾ inches, used as one of the pieces in a mail campaign. The back of the card contains a further description of the stock, a price list, and a convenient order form.

Mailing Cards.—Special mailing cards make excellent follow up to announce special prices or the expiration of the discount.

A well planned mailing card of the maximum size permitted by postal regulations can make a mailing piece complete in itself by summing up the most important selling appeals and using them along with prices. Sometimes part of the card can be used as an order blank. Both sides of the mailing card can be utilized for the selling message, but under postal rules, a blank space of at least 3½ inches from one end of the card must be provided for the address space.

LETTERS

Letters will have a part in the selling program of every well organized hatchery. Next to a face-to-face visit with the prospect, the letter is probably the most personal form of contact. Since letters reflect the personality of the writer, every letter should be written^o with the idea of creating a favorable impression.

The Letterhead.—The use of legible type or lettering, striking color combinations, an attractive illustration or trademark, and good

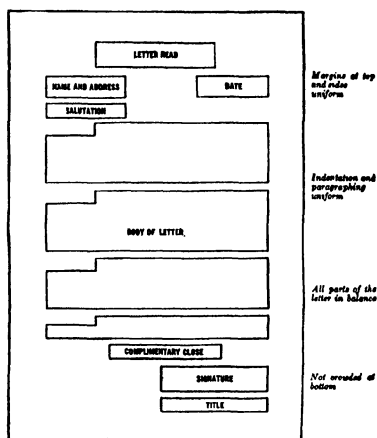


Fig. 121.—Good arrangement makes the letter easier to read.

paper stock, all help to reflect the character of the hatchery. White paper of good quality usually produces the best effect, but very light tints of blue, gray, buff, green or yellow are distinctive. When dark tints are used, the writing will not be as easy to read.

The letterhead should contain your name and address, your street address if you have one, your telephone number, and what your business is. These things are essential if it is to be complete.

Physical Make-up.—Do not crowd the letterhead with typewriting. Allow good margins all around. Use short paragraphs. A solid block of type 2 or 3 inches long looks difficult to wade through. Ar-

range the letter, so it looks easy to read. Keep the type clean. The correct arrangement of a letter is shown in Figure 120.

Writing a Sales Letter.—A good sales letter must go through certain steps based upon the principles of good salesmanship. Every sales letter must contain (1) a point of contact, (2) conviction, (3) persuasion, and (4) a clincher.

1. *Point of Contact.*—Secure the reader's attention right at the outset. Say something that will make him want to read further. Start out in a friendly manner. Appeal to his self interest.

Good contact can be obtained by using a news item, quotation, a striking statement of interesting facts, a question, or an incident or story. Here are some examples of good contacts:

Do you want the best chicks for the least possible money?

"A stitch in time, saves nine." In this case it can actually save you 3 to 8 cents per chick.

If you are going to grow any chickens this year, you will have to get them started in the next few weeks.

2. *Conviction.*—Give the reader a clear idea about your chicks and convince him that they have merit. It is easy enough to make claims about the breeding back of your chicks and what they will do for the customer, but it is an entirely different matter to prove these statements. Proof can be offered in the form of official egg laying contest records, record of performance records, customers' reports, quotations from reliable sources, guarantees, references, etc.

Study these examples of conviction:

We now have 375 superior poultrymen located all over New England for our sources of supply of hatching eggs. One hundred and fifty of these flock owners have been with us 5 years or more, and 36 have been shippers for 10 years or more.

To be considered for admittance to our family of flock owners, every bird in a flock must be state tested for pullorum disease without a single reactor being found. And they must be tested and found clean each year thereafter.

During the past laying test year, Twichell New Hampshires topped all other pens of this breed, in three out of the four standard tests entered. We had two pens at Maine, and one each at Western New York, Connecticut, and Rhode Island—five pens in all. Because of our dual entry at Maine, there were only four top positions possible—and Twichell took three of them—three out of four.

3. *Persuasion.*—Conviction and persuasion are very much alike, and are very often interwoven in sales letters. While conviction tries to appeal to the prospect's understanding, persuasion appeals to his

emotions and desires by showing him just how he will benefit from the purchase of your chicks.

Analyze your various selling points to pick out the most effective one. It may be your guarantee, the service that you offer, or price. Help the reader make up his mind to order by showing him how he will profit by doing so.

Here are some fair examples of persuasive material from hatchery letters:

And, best of all, you take no risk when you buy our chicks. If they die, a letter to us stating your loss will bring you a full adjustment, either in cash or chicks, as you wish. Our business has been built on our honest business methods. Our guarantee means just what it says. FULL SATISFACTION on Every Order. Our chicks have to make good, and they do.

You can make a big saving by ordering your baby chicks or eggs for hatching now for spring delivery. We are offering ten chicks free per hundred on orders placed now, making a saving of approximately 10 per cent of the purchase price. The demand for our chicks always exceeds our supply, but if you order now you have your choice of dates and we guarantee to make delivery on the exact date you select.

4. *The Clincher*.—Every sales letter should ask the reader to take some specific action, such as filling out the order blank, telephoning the hatchery, or calling at the hatchery. A self-addressed envelope requiring no stamp, a printed reply postcard, an order blank that is easy to fill out, a suggestion that the reader reply on the back of the letter, are methods of making it easy for the prospect to order.

Use the enclosed order blank and envelope which requires no postage.

May we suggest that you mail your order in as soon as possible and take advantage of our 10 per cent discount, and special one cent per chick reduction.

Fill out the attached order blank and send it right back by next mail. I will personally see that every chick that comes to you will be 100 per cent perfect.

Get your order in now, sending 20 per cent cash with order, balance within 10 days before shipment.

No postage is required to mail your order. Place the order in the envelope, seal it up, and drop it in the mail, and you will hear from us promptly.

Drop in at the hatchery next Monday or Thursday. We shall be glad to fill your order from the hatches coming off on those days.

Avoid Negative Thoughts.—Give the advantages to be gained by the reader, through the purchase of your chicks, rather than the disadvantages. Avoid statements that raise doubt in his mind. To say "You will find your losses small," indicates that he can expect some of your chicks to die.

Sound Natural.—Many hatchery letters suffer from the use of such phrases as "Yours of the 13th at hand and contents duly

noted," "Beg to acknowledge," "Oblige," "As per," and similar expressions. If you want your letters to sound natural, write as though you were talking face to face with your customer.

Letters that "Sell" the Catalog.—When a catalog is sent in response to an inquiry, there is no assurance that it will be read. One way to "sell" the catalog and arouse the interest of the prospect is to accompany the catalog with a letter giving a clue as to what will be found in its pages.

Letters of this type are most effective when they reach the prospect at the same time as the catalog. Simultaneous arrival is assured with the use of the duplex type of catalog envelope containing a side pocket for the letter. Another method is to use a tipped-in letter on the page facing the inside front cover of the catalog. The latter method was used by an Iowa hatchery for this letter:

It is with real pleasure that, at your request, we send you this copy of our new catalog.

During the past five years, hundreds of other progressive poultry raisers like yourself have written us. They, too, were looking for something better . . . guaranteed quality chicks whose health and high egg production breeding could really be depended upon.

These people investigated Peters-Certified . . . they studied the facts on their breeding, hatching and selection as described in this book.

Today they are our most valued friends and successful customers. Their fine results are a matter of record, and so that you may know what Peters-Certified Chicks have done for others, we are publishing a few of their many successful reports in this catalog and our special breed bulletins.

This book takes you through each important step in our breeding process. It tells all about the mating, the health and production selection of Peters-Certified Strains by our Specialists during the past twelve years . . . the trapnesting and pedigreeing carried on, on our Master-Control Breeding Farm under the official supervision of the Iowa Poultry Improvement Association (Record of Performance rules) . . . the skilled operation of our hatchery, and finally the rigid inspection and selection of chicks by experts before they are shipped.

Make Letters Friendly.—Cultivate a personal tone in your letters. A friendly, person-to-person style instills confidence. Soft pedal the "we" and "our" in your letters and talk more "you." Here is a letter which radiates friendliness and makes you feel that you are personally acquainted with the writer, an Indiana hatchery-woman:

Dear Friend:

Winter is just around the corner—and somehow I can't help but feel that while you are busy housing your pullets in their warm, comfortable quarters, you are thinking of your next spring's baby chicks.

Already we, here, are planning just how we can be of greater service to you than ever before. We are now carefully handling and mating up our Grade A birds which will furnish such dependable chicks for the farmer and commercial poultryman. Our Grade AA is especially valuable for breeders. Perhaps you hatch your own chicks. If so, I am sure you will want some chicks from our Grade AAA or Special Matings that will furnish valuable males for your next season's matings.

Our new catalog is being produced and it will tell you our whole story. Watch for it. If you wish to place your order early we will accept it and give you a 10% discount on any order placed before February 1st. Our prices will be about the same as last year's.

If you have any questions to ask or anything that you would like to say to us, please feel free to write us. We are always glad to hear from our customers and friends.

Have you ever tried raising winter broilers? Many are doing so successfully. One example: Ivan C. Emily of Crandall, Ind., purchased 300 February hatched Barred Rock chicks from us last spring. He raised 94%, marketing them at nine weeks of age and realized a net profit of \$93.94.

We can furnish you with high grade White Leghorn or Barred Rock chicks during January and February at fourteen cents (14¢) net. We will send you special instructions on broiler raising if you wish.

Sincerely yours,

Letters to Old Customers.—Make an effort to keep those customers that you have. Keep close to them throughout the year by sending them a friendly, sincere letter every now and then. Let them know that you are interested in their success. An Ohio hatcheryman sent the following friendly letter to his customers late in the summer:

I hope your pullets are developing nicely. If you will house them at the right time, and feed correctly, I know you will be elated at the number of eggs they will lay this fall and winter. They are correctly bred for heavy laying and the success you will have will depend largely upon your treatment of the birds.

For best results we always like housing our pullets when they are from 5 to 5½ months old, and we advise your doing so. If you leave them on range too long they are very liable to stop laying for a short period when housed, therefore it is best to house them just as they start laying.

It is also best to change gradually from your growing mash to your laying mash, and start making this change when the birds are about 5 months old. Feed prices are lower now and you can buy a good ready mixed feed at a reasonable price, and save yourself much trouble.

Duplicating Letters.—The individually typed letter is probably the most desirable form of sales letter, but when a large number of letters are to be sent out, the individually typed letter is generally too costly to justify its use. At the present time, there are several methods of reproducing letters in large quantities.

The multigraph is a machine for duplicating typewritten letters by printing from type through a ribbon. Multigraph letters are often

very difficult to tell apart from individually typed letters. Because the multigraph represents a rather large investment, it is usually found only in the very large mail order hatcheries, but printers and advertising agencies which specialize in the preparation of hatchery advertising matter, are usually equipped to take care of multigraphing.

A second type of duplicating machine is the mimeograph. No attempt is made to print through a ribbon, or to fill in names and addresses with the intention of matching. The message to be reproduced is cut on a wax-like sheet known as a stencil, through which the ink penetrates. By this method, it is possible to duplicate anything that is typed, written, or drawn in one or more colors. Because machines of this type can be used for circulars, sales letters, price lists, postcards, office forms, etc., and because they can be obtained at relatively reasonable cost, they are found in a large number of hatcheries.

The main drawback with various methods of duplication is the fact that it is difficult to obtain a good match of the fill-in and the body of the letter. A very careful typist can obtain a very good match in the case of multigraph letters, but this is impossible with mimeographed letters. Rather than attempt to use a fill-in, many hatcherymen use some title such as: "150 Pullets Make \$450 Profit," "Do You Want More Eggs in the Dead of Winter" and similar titles. This method is used by some of the most successful mail order advertisers.

HOUSE ORGANS

House organs, which are publications issued at regular intervals, are being used with considerable success by hatcherymen in both local and mail order selling efforts. The usual plan is to issue a house organ monthly throughout the chick season, and less often during the remainder of the year. Some breeders and hatcherymen try to maintain a quarterly schedule.

In some instances, the use of a house organ has made it possible to get along without a catalog. The entire sales story is placed in each issue of the house organ. Instead of receiving just the catalog without any follow ups, as is so often true in hatchery direct-mail campaigns, the prospective customer gets his sales message regularly

throughout the buying season. Thus, the hatcheryman has an automatic follow up system, and herein lies much of the value of the house organ.

PARKS' POULTRY POINTERS

PUBLISHED QUARTERLY BY PARKS BROS. EGG FARM, ALTOONA, PA. WINTER ISSUE 1934

Chick Growing Suggestions

1. Choose a few hen.
The most important thing I can say to the poultry pointer is to avoid spreading. When there is to be a lot of chicks, the chicks are better off being all to be started together than to be started in a few weeks. If you have a lot of chicks, it is better to have them all to be started together than to have them all to be started in a few weeks. If you have a lot of chicks, it is better to have them all to be started together than to have them all to be started in a few weeks.

2. Choose a few hen.
If you would, please, use many chicks to the point you will have enough to start the point of the point. The point of the point is to have enough to start the point of the point. The point of the point is to have enough to start the point of the point.

3. Separate for size.
When the chicks are small, the point of the point is to have enough to start the point of the point. The point of the point is to have enough to start the point of the point.

4. Give them enough space.
A big group of chicks is better to be started together than to be started in a few weeks. If you have a lot of chicks, it is better to have them all to be started together than to have them all to be started in a few weeks.



Group and by approximately moving the chicks, even if for only a few weeks. The best and best results should be secured about frequently.

Now Many Should You Raise This Year?

Answering this question is like answering "How high is up?" Your point is to be on the point of the point. The point of the point is to have enough to start the point of the point.

Order Them Early

Whether you buy from us or from some other producer, we urge you to place your orders early this year. Right now we are nearly booked up for many months throughout the season. But if you place your order with us, we can take care of you in a very short period of time.

A numbered list of prices is given on the back page of this order form. A complete description of all the breeding pairs is given in the general price list, which we would be glad to send. You will find much information on this back page to enable you to place your order without delay.

PRICES on Back Page

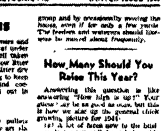


Fig. 122.—While this quarterly house organ tells about the Parks strain, it is built largely around helpful information. This issue contained chick growing instructions, a discussion of different types of brooders, an illustrated article on temperature control in brooding, and chick feeding hints.

Sizes and Styles.—House organs range all the way from those printed on small post cards to large size newspapers. Ordinary good magazine stock is often used, but greater distinctiveness is obtained with enamel and cover papers.

One of the most popular sizes is the 8½ by 11½ inch page with three columns of type made up in newspaper style. In deciding upon the size and shape of a house organ, consult the printer, so that the

size selected can be printed on standard size paper with a minimum of waste.

Subject Matter.—Those hatchery house organs which are doing a good job usually will be found to contain such material as seasonable tips on feeding and managing layers, chick brooding hints, bits of chatty gossip on what is going on around the hatchery, facts about the quality of the chicks, stories about customer successes, snapshots of customers and their flocks, announcements of price changes, news of contest and show winnings, and similar items.

If old incubator equipment is replaced by later models in order to produce better chicks, this fact should be worth a little story for the house organ. Too often, the hatcheryman fails to see those things which make interesting news.

Much of the effectiveness of the hatchery house organ, of course, depends upon the manner in which the information is presented. Keep it personal in tone, and try to reflect an attitude of wanting to be helpful.

OUTDOOR ADVERTISING

HATCHERYMEN CAN USE outdoor advertising to considerable advantage in selling chicks in their immediate territory. Among the forms of outdoor advertising being used with success by hatcheries are small roadside signs, billboards, signs painted on the hatchery, tire covers, signs on trucks, and others.

Essentials of Outdoor Advertising.—The outdoor advertisement should be characterized by simplicity, high attention value, brevity in the message, pleasing color combinations, and good arrangement.

Because most forms of outdoor advertising are read “on the run,” the message itself should be brief—possibly not more than five or six words. Attention can be secured through a picture of the product and a design that is distinctive. The name and address of the hatchery, of course, should be included.

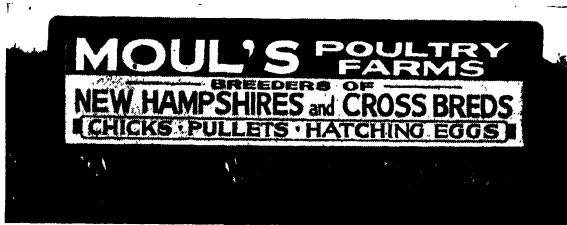


Fig. 123.—A painted sign of billboard size. Roadside signs should be located at an angle to the highway, so that motorists are able to read the sign as they approach it.

Roadside Signs and Billboards.—Roadside signs used by hatcheries vary all the way from little 12 by 18 inch signs printed on heavy cardboard to large billboards or painted signs 20 to 30 or more feet long.

One Iowa hatcheryman distributed these small cardboard signs on all roads within a 60 mile radius of the hatchery, directing buyers to his hatchery. Since most signs of this type are printed black on a bright yellow or orange stock—the strongest color combination known—they are hard to miss. Most of these cardboard signs used by hatcheries receive a coating of paraffin, consequently, they withstand weathering very well and often have a life of more than a year.

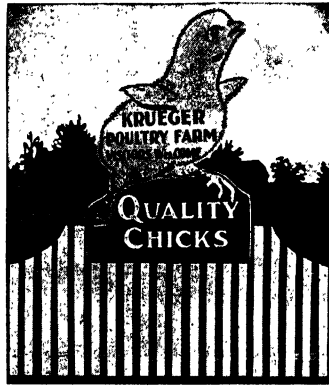


Fig. 124.—A cut-out sign like this has high attention value. (*J. H. Buswell.*)

Where there are state laws prohibiting the posting of signs along the right of way, permission should be secured from the farmer to tack signs on his fences or buildings. An Illinois hatcheryman got around any possible objections from farmers by issuing credit coupons for the privilege of hanging his signs. These coupons could be used as part payment on orders for chicks or supplies.

Signs cut out in the shape of a chick, hen or a rooster on which is painted the hatchery's message, are quite striking in appearance, and many hatcherymen have employed this type of sign with considerable success.

Cut-out signs of stock designs may be secured at a reasonable cost, but the hatcheryman who wishes to make his own cut-out signs may use the method for making window display backgrounds described in Figure 130 in Chapter XXIII. Such signs, when in-

tended for outdoor purposes, should be made of either heavy sheet metal or some strong, weather-proof composition board such as pressed wood.

When the outdoor advertising campaign is to be a rather extensive one, it may include billboards and large painted signs. Since the most desirable locations for these large signs are usually held by outdoor advertising companies, it is advisable to consult one of these companies when planning a campaign of this extent.

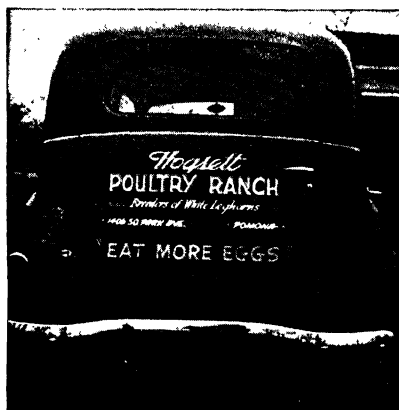


Fig. 125.—The back end of a light delivery truck is used by a California poultry breeding farm to advertise its name, and also to promote egg consumption.

Signs that are close to the highway should be placed at about a 35 degree angle to the highway. This will enable the motorist to see them at quite some distance as he approaches it. If signs are parallel with the highway, they can easily go unnoticed, for if the motorist is compelled to turn his head, a driving hazard is created.

Each year at the start of the chick season, all roadside signs should be repainted and repaired. Nothing will give the impression of a careless and rundown business more quickly than faded signs that look as though they are ready to fall over. The smaller signs can be brought into the hatchery in the fall or early winter or taken to a sign shop for repainting.

Signs on Trucks and Automobiles.—Any hatcheryman who uses a delivery truck can obtain valuable, additional advertising at no extra cost for space, simply by having his hatchery name and address and possibly the hatchery trade mark or a picture of a baby chick painted on both sides of the truck. Hundreds of people will see these moving signs each day while the truck is being used to take chicks to the postoffice and express office or to deliver them direct to customers nearby.

Automobiles used in servicing flock owners, and even the hatcheryman's pleasure car, can be utilized for advertising purposes. Here the tire cover may contain the advertising message. But as in all forms of outdoor advertising, the message must be brief with the letters as large as possible.



Fig. 126.—This hatchery used the side of the building for a striking sign.

Signs on the Hatchery.—The hatchery itself should be well marked, so that the prospective buyer may have no trouble in knowing when he has reached his destination. Signs serving this purpose should contain the name of the hatchery or farm, the product if not already indicated in the hatchery name, and possibly the address, especially if there is a street address.

Both electric and painted signs are being used to identify hatcheries. Electric signs are effective because they work after sundown. A Michigan farm hatchery used a 6-foot steel rooster about 50 feet back from the highway, floodlighting the sign at night so that it stood out very prominently. Neon signs are extremely effective be-

cause of their high visibility and the opportunity to obtain special designs especially suited for the hatchery.

The side of the hatchery building itself can often be utilized for a painted sign. When the hatchery is located on a business street, the name should be lettered on the show windows, and there should be another and larger sign right above the store front. In this way the hatchery name will be seen by passersby on both sides of the street.

Hatchery Appearance.—The character of the hatchery is reflected in its external appearance and the surroundings. Clean, neatly arranged show windows have considerable advertising value. Shabbiness does not build confidence. A muddy, deeply rutted driveway is not inviting, but one that is smooth and firm will make it easy for the customer to drive into the farm hatchery without hesitation.

On a breeding farm, well-painted buildings, well-kept lawns, and firm roads can contribute much to the visitor's impression that a sound job of poultry breeding is being done.

XXIII

WINDOW DISPLAYS

“WINDOW DISPLAYS offer the retailer a direct, profitable and economic means of obtaining publicity. Their value is due to their nearness to the point of sale. Windows must be changed often and considerable time is demanded to keep the displays at their highest efficiency. Seasons, trends, new merchandise—all must be considered in building window displays that bring the greatest percentage of sales.”—*Small Store Advertising, Domestic Distribution Department, U. S. Chamber of Commerce.*

Hatcherymen who have window display space are fortunate, provided they use it to sell chicks. Hatcherymen who operate farm hatcheries and have no facilities for window displays sometimes arrange for cooperative displays of chicks in the windows of hardware stores, feed stores and other stores in town, using the display to direct people to the hatchery. During the Easter season, department stores in larger cities will often be interested in displaying chicks in their windows, because of the attention they draw.

Essentials of Good Display.—Keep the window glass clean inside and out, so that what is displayed can be seen. Woodwork, floor covering and fixtures, likewise, should be clean. Don't display damaged goods, for this will reflect against the quality of the merchandise handled.

Have a good background that will help to make the merchandise stand out. Light the windows at night. Many people who do not have a chance to see them during the day can view them at night.

Change the display often. In a very small town, the display can go two or three weeks without changing. If the hatchery is located on a busy street in an active, farmers' trading town, the displays should be changed more often. Keep the windows looking neat at all times. They reflect the character of the hatchery.

dow display material which few merchants can equal from the standpoint of interest created.

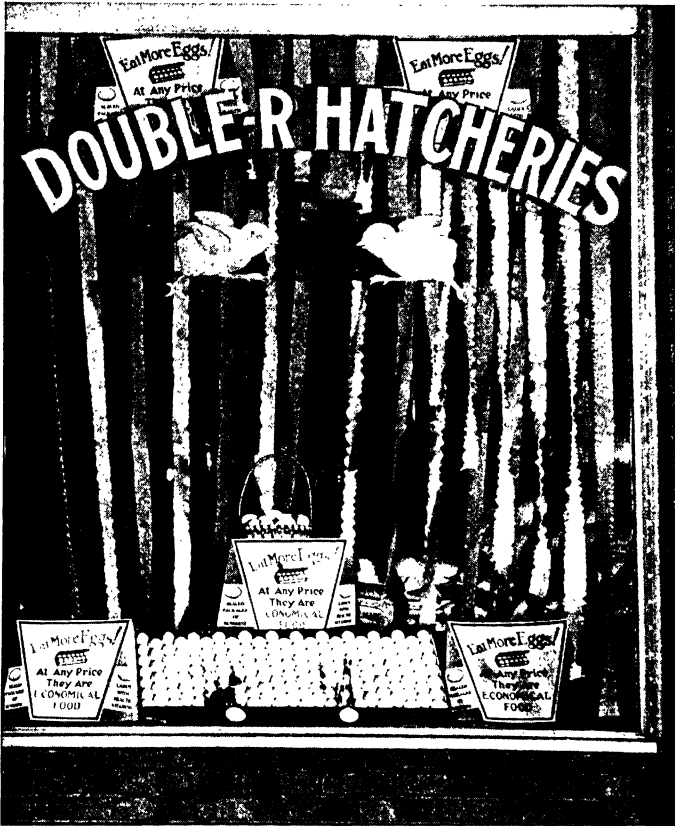


Fig. 129.—This hatchery, located on a business street, used its display windows to promote egg consumption at the season when eggs were plentiful. (*Hatchery Tribune.*)

Probably the simplest way of arranging a display of chicks is to fix the window space to resemble the interior of a brooder house with litter on the floor and the regulation number of feeders and fountains to accommodate the chicks. Electric brooders are usually more satisfactory for window displays than other types.

If the chicks in the window are to create a good impression, they must appear healthy and active. Don't put chicks of different ages into the window. Frequent inspection should be made to remove dead chicks and those that are weak and sickly looking. Change the litter often.

Battery brooders and primary brooders are used to a large extent for displaying chicks. A row of heads bobbing up and down in the feed trough is an interesting sight. When the chicks are displayed in the low-cost, primary brooders of the corrugated board type, hatcherymen often make a combination price on the chicks and the brooder.

Backgrounds.—Good backgrounds add to value of the window display and help to make the exhibit more interesting. Manufacturers often provide window cards, card board setups, and colored backgrounds. Where these helps are used along with packages or containers of the products handled by the hatchery, it is possible to build backgrounds which will not only sell chicks, but sell supplies in addition.

Novelty backgrounds attract attention. With the aid of composition board or pressed wood and a little paint, a hatcheryman who is handy with tools could develop a variety of backgrounds. One background, for example, could be made to look like a miniature poultry farm. Giant cut-outs of chicks, roosters, hens, baskets of eggs, feed sacks, and similar items are good subjects for backgrounds. A method of making these giant reproductions is shown in Figure 130.

Colored Chicks.—A display of colored chicks seldom fails to attract attention. Although colored chicks may be used any time during the year, they are especially appropriate at the Eastern season. Sexed White Leghorn cockerels, which usually bring low prices, are often colored for Easter trade, bringing good prices. In many communities, however, humane societies are active in preventing the sale of such chicks, because of the ill treatment and abuse accorded the chicks by the purchaser.

While day-old chicks can be colored, it is best to use chicks that are from 3 to 7 days old. White Rocks and White Wyandottes are the preferred breeds for coloring, for they do not show any appreciable number of white feathers for three or four days after coloring, while White Leghorns will show white feathers in 24 hours. Because

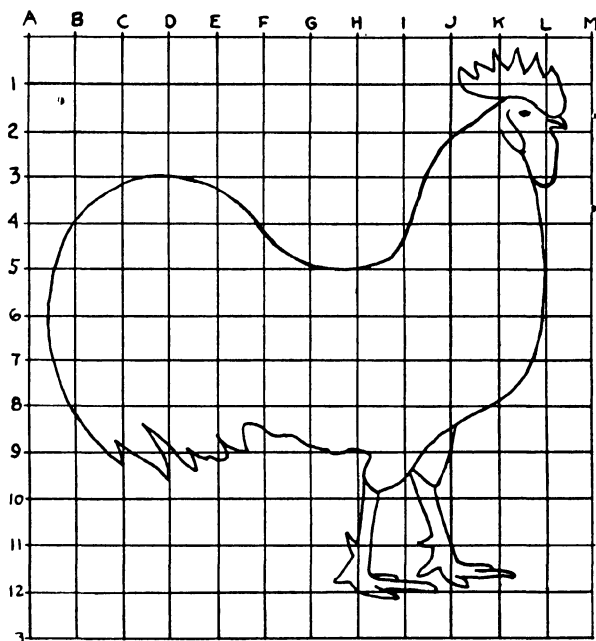


Fig. 130.—A giant reproduction of this Leghorn male may be made by enlarging the squares on a large piece of compo board and drawing the outline of the bird. The excess compo board may then be cut away with a scroll saw. Giant reproductions of feed sacks, chicks, poultry houses, baskets of eggs, remedy packages, etc., for window display backgrounds can be made by this method. Advertising matter and poultry magazines contain pictures that can be enlarged very readily. (*Hatchery Tribune.*)

of the uneven rate of feather growth, colored heavy breed chicks and Leghorns should not be mixed.

The Columbus Vaccine Company supplies the following directions for coloring chicks with the dyes that it manufactures for this purpose:

How to Dilute for Use—Each 4-ounce bottle of dye is sufficient to make one quart of dipping solution—enough for approximately 250 very young chicks if used carefully. First shake the bottle of concentrated dye solution and then take a clean quart bottle and fill it $\frac{3}{4}$ full of soft, warm but not hot, water and add the dye solution. Rinse out the bottle of dye solution with a small portion of the water. Shake several times or until the solution seems to flow uniformly, rather than be spotted on the inside of

the bottle (requires about 1 minute of shaking). Then add sufficient soft water to make one quart and mix all. **DO NOT USE HARD WATER, USE ONLY CITY SOFTENED, RAIN OR DISTILLED WATER.** Do not attempt to dilute the solution further than directed, as then the dye will not work properly. If it is not desired to dilute the entire concentrated color, dilute one ounce ($\frac{1}{4}$ bottle) to $\frac{1}{2}$ pint soft water (at least $\frac{1}{2}$ pint is required to immerse chicks). If one desires to experiment or color only a few chicks, use one teaspoonful dye to 1 ounce soft water and apply to the chicks with a small sponge, cloth or piece of cotton or gauze. We have determined that the concentrated dyes after diluting with water for use will keep for one year so one may mix all the dye and retain the solution without loss. Be sure to shake each bottle of concentrated dye vigorously before diluting. If you are not using the entire bottle, measure out the portion rapidly after shaking.

Warm Dipping Solution—The best type of vessel in which to dip the chicks is an enameled or granite ware pan, not too shallow and one with sloping sides, and one that may be placed on an electric hot plate or stove for a few minutes to warm the solution. After the diluted dye solution is placed in the pan, it is necessary to warm it to 100 to 104 degrees Fahrenheit and keep it close to this temperature during the dipping (be sure and use a thermometer). The dye solutions have a slight odor to them which is necessary. This odor may be slightly uncomfortable to the person dipping the chicks if working in too confined a space. A warm room is desirable, but one ventilated reasonably well is best.

Dipping the Chicks—Hold the chick, back down and with the head in the right hand, hold the beak shut with the first and second fingers and the thumb so the chick cannot swallow the solution. Hold the chick's legs in the left hand with the forefinger separating the legs. **COMPLETELY BUT ONLY MOMENTARILY IMMERSE THE ENTIRE CHICK**, first the head, then body and legs. Hold the chick above the solution, head up, for a few seconds for the excess dye to run back into the pan. Then immediately place the chick in the box for drying. As a few chicks will flap their wings after being dipped, it is best to wear old clothes or a protective apron during the dipping. It is not necessary to hold the wings during the dipping because as soon as the chick's head touches the dipping solution it draws its wings in close to its body. If desired the chick's wings may be held with the left hand also. Learn to dip the chicks rapidly. See following paragraphs for details of the type of box to place the wet chicks in just after they have been dipped.

A small amount of dye solution can be saved by making a small wire platform of $\frac{1}{4}$ -inch mesh hardware cloth and placing it in another tall pan. As soon as the chick is removed from the dye bath it is placed in this pan for a moment before being transferred to the box in which it is to dry. This colored solution that drains off the chick and collects beneath this wire platform may be reused.

Use Rubber Gloves—It is best to use rubber gloves so as not to stain the hands, the thinner the glove the easier to hold the chick. Gloves should be washed between colors and the pan washed out carefully. If all the solution is not used up, it may be poured back in the bottle and stoppered; the diluted solutions should not be allowed to stand in the open pans except when in use.

Ventilate Top of Box—As soon as the chicks are dipped and drained, they should be placed in a small box to prevent chilling. Small shipping boxes are ideal, punch out all ventilation holes. Place an excelsior pad in the bottom, for a lid use a piece of $\frac{1}{4}$ -inch mesh hardware cloth. Do not use cloth or other absorbent material in the bottom of the box as this will remove considerable color from the chicks while they are wet. After about 10 to 25 are dipped, they should be taken by someone to the incubator (operated at regular incubating temperature) or heated brooder room to dry and fluff out. If they are to be dried in the box, retain the flat piece of hardware cloth for a cover which allows ventilation and rapid drying and keeps the chicks from climbing out. It is necessary to ventilate the box to permit the chemicals in the dye solution to

escape, otherwise the vapors may injure the chicks. Do not expose the chicks to direct air currents from the fans.

Drying on Incubator Trays—Chicks may also be dried in small wire pedigree baskets, using the same baskets for the same colors each time. They may also be dried in the incubator (operated at regular incubating temperature) on hatching or incubating trays, but they will color any wood construction. If the chicks are dried on wire trays or in wire baskets, see that nothing is underneath that might be damaged by a small amount of dye solution draining off the chicks while wet. Do not place cloth or newspapers on the trays, as these may absorb the color. When chicks are placed on egg trays a small amount of dye collects on the trays. Therefore, only place chicks of the same color on each tray. Use a separate tray for each color and if placed over each other in the incubator prevent dripping from the upper trays to the lower as this will soil the chicks and make them unsaleable. The rate of drying depends on the humidity and rate of air change. On an egg tray with 50 per cent humidity (no added moisture) chicks will fluff out complete in about one hour. Less favorable drying conditions (higher humidity) will require a longer period for the chicks to fluff out. As above mentioned, do not expose the chicks while drying and fluffing out to direct air currents from ventilating or circulating fans. As soon as the chicks are fluffed out, remove them from the incubator and place them in the brooder, which of course, should be operated at the proper temperature for their age.

Be sure and place only one color of chicks in a box while wet. Different colored chicks, when completely dry, may be mixed without fear of mixing colors. In using the boxes over again, use the same box for the same color.

Once in a while a few chicks, after fluffing out, seem to keep one or both eyes shut. Gently open the eyes with the fingers and the chicks will keep them open afterward.

The colors remain on the chicks for several months when kept indoors and for variable but lesser periods when the chicks are allowed direct sunshine. The diluted dyes may be sprayed on the chicks but we do not advise this method.

Coloring Ducklings—Our dyes may be used to color ducklings as well as chicks. The dyes are regulated to penetrate chick down and because of the extra oiliness of duck down the dyes do not penetrate as rapidly or as evenly on ducklings. Also the color of the ducklings modifies the color of the dyes.

Use Window Cards.—Make it a rule to have at least one descriptive poster or card in the window to carry the selling message. Include the price if possible.

A display of ribbons and trophies brought back from a baby chick show would provide the basis for a strong window card message pointing out how good breeding, proper flock management, correct incubation, and careful selection of chicks were responsible for this show triumph. Window cards should be legible, and the message should be short and simple, so that folks can grasp the thought at a glance.

Suggested Displays.—Guessing contests conducted in the hatchery display window will arouse much interest. Contests of this nature could consist of guessing the number of kernels of corn a rooster will eat during a specified period of time, the weight of the feed in a partially emptied sack, the weight of some baby chicks at the end

of a certain period of time, and similar contests. Close the contest on an evening when a large number of farmers are in town. Use chicks or merchandise for prizes in order to confine interest to farmers and poultry raisers. Contests like these cannot be advertised through newspapers or through the mail. Even though no charge is made to register guesses, postal regulations class such contests as lotteries.

Try colored lights for evening windows. This can be achieved by tying sheets of colored gelatine paper around the light reflectors.

Hook up a microphone to catch the chirping of the chicks in the window and broadcast the sounds by loud speaker to the outside where they will attract the attention of passersby.

On special occasions such as high school homecomings, harvest festivals, and 4-H club roundups, build displays that will tie up with these events.

XXIV

PERSONAL SELLING METHODS

WHILE SOME of the extremely large hatcheries and most of the strictly breeder-hatcheries will probably continue to secure most of their business through the mail, the hatcheryman doing a local business is, as a rule, likely to come into personal contact with the chick buyer before the sale is actually culminated.

This personal contact may occur when the hatcheryman or one of his service men calls directly upon the farmer or poultry raiser to solicit his chick order, or it may occur when the poultry raiser comes into the hatchery. Newspaper advertising, roadside signs, and direct-mail may all play a part in bringing the poultry raiser into the hatchery, while in the case of calls at the farm, these forms of local advertising help to identify the sales representative.

Canvassing.—With the increase in competition, many hatcheries have found it profitable to employ salesmen and canvassers to go from farm to farm to call upon poultry raisers in an effort to get their chick orders. Some hatcheries have had particularly good success using women as representatives, for a woman will often succeed in getting a hearing where a man may get a cool reception. It is important, however, that the men and women sent out by the hatchery be trained poultry raisers.

Even though a call may not result in a sale the first time, the canvasser often can obtain information that will be of value in knowing whether or not the prospect is worth following up later. For this reason, the hatchery canvasser frequently fills out a card for each prospect called upon. This card includes the name and address, number and breed of chickens, type of housing, equipment, method of brooding and similar information together with comments.

Four Steps in Selling.—There is very little truth in the statement "Salesmen are born, not made." Any hatcheryman with average intelligence, a fair personality, and a desire to learn can become

at least an average salesman. Facts presented in a sincere manner will carry more weight than any high pressure oratory based on theories.

Consciously or unconsciously, a hatcheryman goes through four steps in every sale of chicks that he makes to someone who calls at the hatchery. These steps are:

1. The approach in which he establishes a friendly contact with the prospective customer through a courteous greeting.
2. Leading the conversation to some particular article or product.
3. Creating in the customer's mind a desire to own those chicks.
4. Closing the sale.

The Approach.—When we go into a retail store to buy something, we like to be greeted in a friendly, brisk, “glad-to-see-you” manner, not as though meeting us is just another irksome task in the day's work. This most certainly applies in meeting chick buyers. A friendly smile with a cheery “Good Morning,” will go a long way in creating a favorable attitude in the mind of the prospective customer. Call him by name if possible. All of us like to think that we are important enough to be known by name. By paying attention to certain characteristics and associating them with individuals, it is possible to develop the knack of remembering names.

Meet customers promptly when they come into the hatchery. Routine work should be dropped, so that customers may receive prompt attention. If the hatcheryman is already busy with customers, he should excuse himself for a moment to tell newcomers that he will be with them shortly. One way to take care of these folks is to have a couple of good comfortable chairs where they can seat themselves and look through some poultry magazines or the hatchery catalog. If supplies are handled, it might be better to have these folks walk around and examine the equipment, and a comfortable chair, of course, would then be out of place. Don't make these customers wait one bit longer than absolutely necessary.

No customer likes to be approached by a salesman who is slouchily dressed or whose beard shows several days' growth. In the mind of the customer, such carelessness with respect to personal appearance reflects upon the ability of the hatcheryman to turn out quality chicks. Neatness counts. In some hatcheries, all workers are attired in the duster style of coat with the hatchery name lettered on the

back of the coat, or embroidered in some color on the upper left breast pocket.

Getting Customer to Indicate Desires.—The second phase in greeting the customer consists largely in asking a question to get the customer to tell what he is interested in. It may be a question such as "What can I do to serve you today?" or "May I show you some of our Barred Rocks which were hatched this morning?" Once the customer has indicated his desires, the next step is to arouse his interest and create in him a desire to own those chicks.

Creating a Desire to Own.—Perhaps the customer may be undecided as to whether he should buy day-old chicks or started chicks. In such a case, it may be necessary to help him in making a decision, and this may be done by permitting him to look at both the started chicks and day-olds, explaining the advantages of each.

If for sanitary reasons, all visitors are excluded from the incubator and brooder rooms, but allowed to view the chicks through a glass partition, an explanation similar to the following probably should be made:

We're taking no chances with disease. You perhaps know that all breeding hens supplying our hatching eggs are blood tested. We do this to make sure that no pullo-rum disease is present here. Our incubators are fumigated during incubation and between hatches. But with so many people, some of them not as careful poultry raisers as you are, coming into the hatchery every day, disease might easily be introduced. We know it pays our customers to receive good healthy chicks, and we know that it pays us to deliver such chicks. So, you see, this glass partition is for your own protection.

An explanation like this should help to convince the prospective buyer that no effort is being spared to turn out quality chicks. Note, too, the appeal to his vanity by classing him with the "careful poultry raisers."

Since most customers are interested in what the chicks will actually do for them, build your sales talk with facts. Cite actual instances of customers who have successfully brooded chicks or who have obtained good egg yields. Mention names. Give figures. It will make the sales talk more real.

If you have really good chicks for sale, you won't be groping for things to say. If you produce chicks under some plan of official supervision, explain the requirements of accreditation, certification, or record of performance—whichever plan you operate under. Tell

about the purchase of high grade cockerels for your flocks, the careful selection of hatching eggs, and the many other things which will influence the customer's profits.

Meeting Objections.—When a customer comes into the hatchery with his mind already made up to buy chicks, the problem is one of selling him the proper number of chicks. Very few sales, however, are made without some objections being raised as to quality, price, date of delivery, and other points. H. H. Maynard and R. E. Cray, writing in *Hatchery Tribune*, tell how to meet objections:

Successful salesmen have found that it is best to answer every objection when it is brought up. If he has an objection and you delay your answer, you really magnify the problem in the mind of the customer. Be perfectly willing to have objections raised; do not act as do some salesmen, as though an objection were a reflection on your product. Remember that the objection shows a natural state of mind of a customer who does not know the whole story. Be sympathetic; welcome objections, and answer them fully.

If you have a good product and know your goods, you can answer all objections that will be raised. Sometimes you will have to admit the force of the objections. Do so willingly and graciously.

For example, customers frequently say that they can hatch chicks more cheaply than you can. If this is true, admit it, but add that the convenience of already hatched chicks more than compensates for the slightly higher cost.

If a customer says that he can buy chicks for less money in the next county, show that the convenience of getting them near home makes up for the slightly higher cost. Other objections of similar nature can be met in the same way if you know your product.

Perhaps the main thing to remember in meeting objections is that they are natural and they should not challenge you to an argument or a verbal fight. Such an affair oftentimes results in loss of sales, for some customers will refuse to buy just to win the argument.

Stress the point, when price objections are raised, that breeding is not visible in young chickens and that it can only be measured in egg production when fully grown. Show how the practice involved in breeding for higher production involves more costs.

If after all these facts, you find the prospect is looking for price alone, tell him that you do not have the kind of chickens that he is looking for, and that you do not have them because most people are coming to realize that quality chickens are the only ones that it pays to raise. In this way, you will build satisfaction and build the repeat sales which will cut your selling costs in the future.

Closing the Sale.—If you have succeeded in answering all objections to the customer's satisfaction, and have properly developed your sales points, you should have, by this time, created in him a desire to own some of these chicks. The next step, of course, is to get him to tell you that he will take a certain number of chicks.

When the customer has some difficulty in making up his mind as to number of chicks or the variety, you may have to help him decide

by saying something like this, "It was 350 chicks you said you can handle, wasn't it?" or "Will Thursday's hatch be all right?" or "Shall I box up 300 Barred Rocks?" Such questions make it easier for the customer to say "yes."

And when you ring up the sale or complete the order, don't forget to say "Thank you," and extend an offer of your services any time that he has any poultry questions.

Some Selling Don'ts.—Chick orders are frequently lost through some tactless remark by the salesman or some other fault in handling the customer. Here are some things that should be avoided in order to keep the prospective buyer from becoming angry or disgusted:

1. Don't talk so much that the customer doesn't get a chance to say something now and then. When you do talk, say something worthwhile.

2. Don't over-sell customers who lack either knowledge or equipment to raise a large number of chicks. Such a policy does not build repeat business.

3. Don't talk about such touchy subjects as politics, religion or prohibition. Tactfully steer the conversation back to chicks.

4. Don't get too familiar, but avoid the other extreme of assuming an air of inferiority. If you are selling quality chicks, there is nothing to be ashamed about. Treat the customer courteously.

5. Don't make claims so strong that the customer doubts other reasonable statements. You can't build confidence and respect by making exaggerated claims.

6. Don't knock your competitor. You may honestly feel that he is a scoundrel, but don't let your customer know that you think so.

OTHER FORMS OF ADVERTISING

Exhibits.—Poultry raisers who cannot be reached through newspaper or direct mail advertising can often be contacted through exhibits at fairs and poultry shows. This form of advertising is particularly suited to the hatcheryman who does a year around business on feed, equipment and poultry supplies.



Fig. 131.—The hatchery exhibit should be built around some central idea.

A good exhibit should be built around some central idea, and it should have some means of attracting attention. A South Carolina hatcheryman secured the names of 14,000 prospective chick buyers at his state fair exhibit. Three battery brooders full of newly hatched chicks did a good job of getting folks to stop. A prize of 100 high grade chicks was offered to the person making the nearest correct guess as to the number of chicks in the brooders on the opening day and the number still living on the last day of the fair. The blank on which the guesses were recorded included space for the name and address, number of chickens already owned, and whether or not the prospect wished to receive chick literature—all the infor-

mation needed to know whether the prospect was worth a follow up!

Many other contests will suggest themselves to the wideawake hatcheryman. Results of guessing contests, however, cannot be published in newspapers, because such contests are considered in violation of lottery laws and cannot be circulated through the mails.

Colored baby chicks seldom fail to attract a large number of people. The method of coloring chicks has already been described in the chapter devoted to window displays.

Posters which give some information about the chicks and other products on display, add much to the educational value of exhibits. The posters and charts used should be attractive, yet short and simple enough to be easily understood by the average person.

Throughout the duration of the exhibit, someone should be on hand not only to give out advertising literature and to answer questions, but also to protect the exhibit from the depredations of enthusiastic small boys who attempt to outdo one another in gathering souvenirs from the various booths.

Theaters.—Although the use of advertising slides has disappeared in the larger theaters, small town theaters continue to use slides, since local merchants usually are unable to sponsor advertising films. The advertising slide offers the hatcheryman another chance to put his name before the public. The cheapest form of slide is one that will receive a typewritten message, but where an illustrated slide is desired, it is best to get in touch with slide manufacturers.

Radio Advertising.—Some hatcheries have used the radio to aid in selling their chicks with considerable success over a period of years, while others have found the results somewhat disappointing. One of the criticisms is that the audience is not comprised of poultry raisers, consequently, a large number of folks may write for literature out of curiosity, and only a small percentage of inquiries may be turned into sales.

While some of the larger hatcheries have used super power radio stations with success, the average hatcheryman is most likely to find that local stations with limited power will fit best into his advertising program, especially if those stations carry quite a few programs of special interest to farmers.

Programs must be planned with great care. It is easy to offend listeners with long announcements when they are primarily interested in entertainment. This is especially true during the evening hours. In the daytime, however, speaking programs may secure a better hearing.

The broadcast advertiser may use time "on the air" in several ways. He may contract for a specified period of five or more minutes regularly each week at a set hour for a definite number of weeks. Or he may have a message of 50 to 100 or more words announced in the special type of program in which advertising announcements of different firms are interspersed with music and educational matter.

A large Illinois hatchery for a number of years sponsored an entertaining evening program known as the "Hayloft Theater." An Ohio hatcheryman sponsored a series of nine half-hour weekly programs over a high power station starting the last of December and continuing through February. The programs were composed of popular old favorite songs calculated to appeal to the type of prospects he wanted. Three announcements were used: at the opening, middle, and end of the program. The chirping of chicks was heard throughout the announcements which urged the listeners to send for the mating list.

Five-minute, mid-day broadcasts every day during the height of the chick season boosted sales for a South Carolina hatcheryman. His programs were devoted mainly to poultry talks and a special period in which he answered poultry questions submitted by listeners.

Radio programs should be distinctive and of sufficient interest to maintain a regular audience. The entertainment should automatically remind the listener of the hatchery sponsoring the program.

Athletic Teams.—Some hatcheries have equipped and sponsored basketball teams and secured considerable publicity in surrounding towns. Where basketball enthusiasm runs high as it does in many small towns, and where it is possible to sponsor a winning team, this form of advertising should be very effective in giving prominence to the hatchery name.

Baby Chick Day.—In a Texas town located in a region where efforts were being made to encourage poultry raising, merchants

sponsored a "baby chick day" with a baby chick show as one of the special attractions.

Through an arrangement with the local hatcheryman, the merchants issued a coupon, good for one chick at the hatchery, with each dollar purchase. Thus, a five dollar expenditure was good for five chicks. Since five chicks were really too few to bother with, the hatcheryman usually succeeded in selling additional chicks to fill out the order for 25, 50 or more chicks.

Telephone.—An Ohio hatcheryman used the telephone to good advantage in selling chicks. Because country folks have the habit of "listening-in" on community lines, the telephone line is a busy medium for the exchange of ideas, plans, and suggestions. This eavesdropping is always taken in good faith, however.

Once a month, this hatcheryman made it a point to call some of his more prominent and successful customers to ask how they were getting along with their chicks and to offer suggestions on their care and management. In the course of his conversation, he quoted special prices on additional chicks and described their qualities in an interesting fashion. His telephone calls were made about 8 o'clock in the evening, an hour when most farmers are at home.

Novelties.—Novelties appeal strongly to many people, and hatcherymen have used them effectively at the hatchery, at exhibits, and in mail advertising. The best novelties are those which cost little, yet have a comparatively long life.

A pencil with the hatchery name imprinted upon it will come very near meeting these specifications. A Kentucky hatcheryman gave away pencils imprinted with his name and address and the following statement: "Our customers make no mistake when they order from us, that's why we left the rubber off."

Thermometers are frequently used. A large feed concern supplied its dealers with small brooder thermometers bearing the dealer's imprint as well as the name of the feed.

Calendars.—A calendar is one of the best forms of reminder advertising that a hatcheryman can use. If the calendar has an attractive picture and numbers large enough so that they can easily be read across the room, it will do a year around job of advertising in the home into which it goes.

Often it is possible to obtain excellent calendars with the hatchery

imprint from feed and equipment concerns without cost. When such calendars contain timely poultry hints for each month of the year or a space for the daily egg record as many of them do, their value to the flock owner is greatly increased.

Cooperative Advertising.—When a number of hatcheries have something in common such as an association trademark, a group code of ethics, a breeding program with certain definite and rigid standards, they may logically pool some of their advertising expenditures and conduct an advertising campaign that will be of common benefit to the hatcheries participating.

Sometimes, the cooperative advertising efforts take the form of association advertisements built around the idea that the members can supply chicks of a certain quality. The individual members may have their names and addresses listed in the advertisement, or the members may be identified in literature sent out in response to inquiries.

Most cooperative hatchery or breeder advertising efforts, however, do not take the form of publication advertising. Usually, the cooperative program may consist of literature or news releases sent out from the offices of baby chick or poultry improvement associations.

The Oklahoma Baby Chick Association, to cite an example, conducted a contest to obtain a slogan urging the purchase of Oklahoma hatchery chicks. The contest was given publicity in local newspapers throughout the state, and each association member had the opportunity to capitalize on the interest created in his own community.

There have been instances where groups of this type conducted egg recipe contests within their state. While such a campaign is usually directed to consumers, farmers also become aware that here is a live organization promoting interest in what they have to sell, and naturally it helps to get more attention for the literature on chicks which the association may circulate.

A midwest poultry improvement association was active over a long period of years in building interest in the quality of chicks obtainable from its members. Bulletins containing helpful information on chick buying, brooding, range rearing, feeding for egg production and other phases of poultry management were circulated at certain intervals to prospective chick buyers. These bulletins put across

points in favor of the chicks sold by the members of the association, but the main emphasis was placed on practical poultry hints that every flock owner can use.

Regardless of Conditions in the Poultry Industry—Regardless of the Size of Your Operations—BETTER-BRED CHICKS ARE ALWAYS MORE PROFITABLE

WHERE TO GET BETTER BRED CHICKS
The Ohio Poultry Improvement Association has the files of the best breeders in the State. They are listed in the "Poultry Breeder's Guide" which is sent to you free of charge. It contains the names and addresses of the best breeders in the State. It also contains the names and addresses of the best hatcheries in the State. It is a valuable reference for every poultryman.

THREE NEW BARBARYS IN SET CUT TO 2 OTHER EXPENSES
The new set of three Barbarys is a valuable addition to any flock. They are the only set of three Barbarys that are guaranteed to be pure. They are also the only set of three Barbarys that are guaranteed to be healthy. They are the only set of three Barbarys that are guaranteed to be profitable.

LOOK FOR THE STAR SYMBOL THE MARK OF BETTER-BRED CHICKS

OHIO-P. I. APPROVED CHICKS
The Ohio Poultry Improvement Association has the files of the best breeders in the State. They are listed in the "Poultry Breeder's Guide" which is sent to you free of charge. It contains the names and addresses of the best breeders in the State. It also contains the names and addresses of the best hatcheries in the State. It is a valuable reference for every poultryman.

OHIO-P. I. CERTIFIED CHICKS
The Ohio Poultry Improvement Association has the files of the best breeders in the State. They are listed in the "Poultry Breeder's Guide" which is sent to you free of charge. It contains the names and addresses of the best breeders in the State. It also contains the names and addresses of the best hatcheries in the State. It is a valuable reference for every poultryman.

Fig. 132.—Inside of a broadside folder issued by the Ohio Poultry Improvement Association to emphasize the superior values of the chicks offered for sale by hatcheries and breeders participating in the flock improvement and disease control program supervised by the association.

Another activity of this association is the release of news articles at appropriate times to newspapers and farm publications. One typical release brought out the fact that 60 members of the association had spent \$37,269 in one season for pedigreed males to improve the flocks supplying eggs to these hatcheries. Here we see a form of cooperative publicity in which an association can secure better results than can be obtained by a few individual hatcheries which have grouped together.

Newspaper Publicity.—Local newspapers would print more news about hatcheries if they could get it. Here are some of the things they will print:

1. Openings and closings of the hatching season, provided there are enough facts and figures to make a story.
2. Expansion and improvements at the hatchery, such as increases in the hatching or brooding capacity.
3. Changes in the personnel of the hatchery.
4. Prizes won by chicks raised by local hatchery customers.
5. Prizes won by the hatchery in baby chick or poultry shows.
6. Interviews with the hatchery operator on seasonable poultry subjects.

Articles submitted to the newspaper should deal only with things that are happening at the time or which will take place in the future. The "meat" of the story should appear right in the first paragraph, so that the reader can get the story if the remainder of the article happens to be omitted. Notice how well the following article meets these specifications:

52,000 INCUBATOR

ADDED TO HATCHERY

The Blankville Hatcheries, owned and managed by John L. Jones, and located about one-half mile from Blankville on the new Peterson Road, has just enlarged its capacity by the addition of a new 52,000 Smith all-electric incubator. This hatchery which specializes in Barred Rocks, White Rocks, S. C. Reds, New Hampshires and Crossbreds now has the capacity for handling 156,000 eggs for incubation.

This is one of the largest and most modern hatcheries in this section of the country, and produces thousands of baby chicks weekly from supervised flocks.

It is of interest to visit this hatchery and see the sanitary conditions under which the plant is operated. They specialize in day-old and two and three week old chicks which are started in life under conditions which assure them of being strong and healthy.

The chances of getting the story printed are increased if it is prepared in such a fashion that it is easy to read and edit. Stories should be typed double-spaced on one side of the paper, allowing

good margins, especially at the top of the page where the headline is to be written. When there are two or more papers in the town or even in the county, separate stories should be prepared for each. Never send carbon copies.

Don't flood the newspapers with stories having little news value, and don't try to include anything in the story that really should be paid for as advertising.

XXVI

GOOD WILL BUILDERS

WEAK, PUNY CHICKS that die off easily do not build good will for a hatchery; neither does the delivery of chicks a week before the customer is ready and expects them, nor the delivery of the chicks several weeks after they are promised.

Good will is a valuable asset, and the hatcheryman who has the confidence of a large number of poultry raisers is spared much of the expense that he would have if he had to sell his annual chick output to an entirely new list of customers every year. Good will builders here, as distinguished from more direct forms of advertising, refers to those activities which help to create an attitude of confidence and friendliness toward the hatchery.

Be Thoughtful of Others.—There are many ways to build good will. The hatcheryman who has a pleasing personality and takes a genuine interest in people has an advantage. He will go to the trouble to congratulate folks on such occasions as births, weddings, achievements of young people in school, and others. Likewise, he will remember to send a note of sympathy to bereaved families.

At Christmas time, he will re-establish contact with his customers and flock owners by sending each a holiday greeting and well wishes for the new year. In some instances, the use of a neat return address on the flap of the envelope has served to check up on the accuracy of the mailing list.

Poultry Library for Customers.—An Illinois hatcheryman maintained a circulating library for his customers. Through this library, poultry raisers who could not afford to purchase \$2.50 to \$4 poultry books were given an opportunity to read some of the best books available on poultry management. When a book was taken out, a deposit of 15 cents was made, and 5 cents a week was charged until the book was returned. The time limit was four weeks.

Cooperation With 4-H Club Work.—Hatcherymen can build much community good will by cooperation with 4-H club work which is now the largest and best organized youth movement in the country. Here are some of the ways in which they can cooperate:

1. Pay the expenses of the county poultry champion to the state fair or the state club roundup.
2. Offer prizes in cash, medals, trophies, or poultry equipment at the county poultry roundup.
3. Offer to be ready to give a poultry talk or culling demonstration at the local club meeting.
4. Allow the club to hold one of its meetings in the hatchery, and then give an interesting explanation how the incubators are operated.
5. Actually start boys and girls on their project work by providing them with chicks, a certain number of which are to be returned when mature.

In all cases, the hatcheryman should carry on all forms of 4-H cooperation through the local leader and the county leader. Most states have plans under which hatcherymen, service club members, and others can cooperate with 4-H poultry projects by providing club members with chicks on a share basis. The following plan was used in Nebraska a number of years ago:

1. Regularly enrolled 4-H poultry club members wishing to take up this project must first prove to the satisfaction of the hatchery operator and the county extension agent that they are equipped and capable of conducting this in accord with 4-H poultry club outlines.
2. Each member must have at least 100 chicks. Over 300 are not encouraged.
3. Where more than one member belongs to the same family, the chicks may be raised in one brood on a partnership basis. Partnerships may also be worked out with the parents.
4. The "Grow Healthy Chick Score Card" will be used to determine the qualification and eligibility of club members making application for chicks.
5. Twelve cockerels are to be returned to the hatchery for each 100 chicks taken.
6. October first ends the year for 4-H club members so that cockerels must be returned about this time.
7. Unless otherwise agreed, the hatchery will take 12 good healthy cockerels, but neither all first choices nor all second choices.

The responsibilities for the success of the project are divided as follows:

A. Duties of the Hatchery Operator.

1. Examine all applications in cooperation with the county extension agent and approve those meeting requirements.
2. Furnish approved applicants highest quality chicks and all of same variety.

3. Visit each poultry club cooperator at least twice during the spring and summer.
 4. Furnish no chicks later than the month of April.
 5. Take cockerels off the hands of club members not later than October 1.
- B. Duties of the County Extension Agent.*
1. See that all applicants are regularly enrolled 4-H poultry club members.
 2. See that all 4-H poultry club lessons are made available to each member at the proper time and through regular club leaders.
 3. Examine all applications with hatchery operator and approve all meeting requirements.
 4. Visit club members with hatchery operator. Give any assistance and encouragement needed.
- C. Duties of 4-H Poultry Club Member.*
1. Acquaint himself or herself with the requirements and details of this project.
 2. Keep accurate records on the "Chick Mortality Record Card" furnished.
 3. Prove to himself, the hatcheryman, the parents, and the neighbors, efficiency as a club member and poultry raiser.

Hatchery Openings.—Many hatcheries have adopted the practice of holding an "open house" or special opening day soon after the season's operations have gotten underway. Through newspaper articles, advertisements, handbills, and circulars addressed to box holders on the rural routes, a general invitation is issued to everyone to come to the hatchery and see the big incubators in operation, observe chicks in battery brooders, and examine displays of poultry equipment and supplies.

"Door prizes" and various contests add to the interest on such occasions. An Indiana hatcheryman aroused considerable interest on such a one-day occasion by offering free meal tickets for a banquet dinner to the first 50 farmers or farmers' wives to ask for reservations. Souvenirs such as miniature bags of feed, brooder thermometers, pencils, and so on, are valuable on these opening days.

A North Dakota hatcheryman served sandwiches and coffee all afternoon on the opening day, also had a feed company specialist discuss brooding problems, while a Minnesota hatcheryman topped off a highly educational program with a dance in the evening.

An Illinois hatchery opened the season by staging an egg show, inviting all poultry raisers in the community to bring in eggs and enter them free of charge in this show. Classes were provided for white and brown eggs, and five ribbons were offered in each class. For first premium in each class, the hatchery offered to custom hatch free of charge one tray of 150 eggs.

While it is easily possible to sign up many chick orders at a hatchery opening, it is well to avoid any tactics that would make visitors

feel that they are obliged to order then and there. The order book and pencil, of course, should be handy, but an event like this should be staged for the contacts and friends that are made.

Poultry Schools and Clinics.—Inexperienced chick buyers are a serious problem to the hatcheryman, for their success or failure can exert a definite influence upon future business. Educating the chick buyer is the only way to avoid many failures in chick raising, and the hatcheryman is the logical person to sponsor such a program, for by so doing he not only renders a worthwhile service, but protects himself as well.

Recognizing the value of having satisfied customers, many hatcherymen are conducting one or two day poultry schools for chick raisers of the community. A typical spring school of this sort would include talks on types of brooder stoves, construction of brooder houses, methods of feeding chicks, sanitation practices, control of diseases and similar problems that confront the chick raiser. A fall school, on the other hand, would be devoted largely to the feeding and management of the layers.

The showing of a poultry film is frequently an added attraction at these poultry schools. Excellent movies, many in color and some with sound, are available from commercial concerns in the poultry field, various state agricultural colleges, and the U. S. Department of Agriculture, usually for the transportation charges only.

Sometimes a community poultry show is held in connection with the school. A summer poultry school could take the form of a picnic.

In some states, these schools are conducted by the poultry extension specialists of the state college of agriculture, and a number of hatcheries may go together in promoting the school and sharing expenses. In other instances, the hatcheryman may cooperate with the county agricultural agent, local high school agricultural teacher, or Farm Bureau agent. Speakers may include college poultry specialists, county agents, representatives of commercial organizations, and others.

During the fall and winter months especially, poultry clinics are quite popular. Since disease is probably the most serious profit limiting factor in the average farm flock, it is not difficult to get out a large crowd for such an event.

Remedy manufacturers have taken the initiative by supplying

veterinarians to conduct these clinics for hatcheries. Poultry raisers are invited to bring in sick chickens to the hatchery on a specified date for a diagnosis. The birds are opened and examined by the veterinarian who explains his findings and makes the necessary recommendations for treatment. These clinics usually result in quite a boost for the hatchery's sales of remedies.

Support Worthy Movements.—The hatcheryman who keenly appreciates the value of a well developed poultry interest in his territory will make it a point to support local and county poultry associations, poultry shows, the Poultry and Egg National Board, and any other movements that react to the benefit of poultry raisers.

Participation in local activities such as the community chest, Red Cross campaigns, Boy Scouts, Girl Scouts, and others are indicative of interest in community affairs, and the hatcheryman should take part in them not because they have personal advertising value, but because they are among the duties of good citizenship.

XXVII

SELLING FEED AND SUPPLIES .

WHEN THE HATCHERY industry was still in its infancy, it was possible to operate a hatchery for only a few months of the year and show a profit large enough to provide a good living for the rest of the year.

Those days are gone. Increased production, keener competition, lower prices and the expense of producing better chicks, have made it necessary for the hatcheryman to add side lines that will enable him to show a profit each month of the year, and to be satisfied with less profit from the sale of chicks.

Today, a large proportion of the hatcheries try to keep open the year around through the sale of feed and poultry supplies. Because the hatcheryman has first contact with the poultry raiser when he sells him chicks, he has quite an advantage over any other individuals who may be selling feed and supplies.

Since success in brooding chicks is so closely tied up with right feeding, the hatcheryman can contribute much to the customer's success by getting him to start the chicks on a good feed. If a customer obtains good results from the use of the starter recommended by the hatcheryman, it is possible to keep him coming back for more starting feed as well as growing and laying mashes.

Besides producing additional income for the hatchery, the year around plan of operation also makes it possible to employ well trained poultrymen as assistants and branch managers. Individuals of high caliber and ability usually are not available for only three or four months of the year.

Whose Products to Handle.—There are instances of where large hatcheries have built up a good volume of business on their own brands of feed and on remedies which they have packaged under their own trade name. Usually, however, the average hatcheryman will find it more desirable to handle advertised brands in

order to take advantage of the manufacturer's advertising and the dealer helps that are supplied.

Feeds, remedies and equipment which are known to poultry raisers through advertising which they see in poultry or farm papers are much easier to sell. No time is lost trying to explain the merits of a line of products which the customer has never heard about.



Fig. 133.—Customers will have better results if you are thoroughly familiar with the equipment you sell and can explain its operation. (*Hatchery Tribune.*)

Know Your Products.—The hatcheryman who knows just how a starting mash should be fed to chicks or who can give reasons why one chick feeder is superior to another will have no difficulty telling the customer how he will benefit by the purchase of these products. When new items are added to the hatchery supply line, study the literature of the manufacturers, so as to be able to describe each item's uses and its outstanding features.

Service Work.—Many hatcheries have succeeded in building up a substantial volume of business on feed and poultry supplies by employing one or more service men to visit hatchery flock owners,

customers, and prospective chick buyers, furnishing them with information on culling, feeding, housing and disease control.

Some hatcheries require flock owners who supply hatching eggs to use the feed handled by the hatchery. Besides boosting sales, this also helps to insure good hatchability. Worming of all birds when the flocks are culled is often required also, which, of course, leads to the sale of worm remedies.

Most service work is probably concerned with poultry disease problems, and the hatcheryman who has a practical knowledge of poultry diseases, knows how to make a post-mortem examination, and can advise some way to combat the disease after making a diagnosis, will soon become popular among poultry raisers in the community.

Service work, however, will not make friends if it is conducted solely with the idea of selling remedies. The service man should attempt to correct faulty management if it appears to be responsible for the disease conditions which exist in the flocks. Perhaps, sanitation practices are inadequate, or there may be some defects in housing. The hatcheryman who can offer helpful suggestions on management to flock owners soon becomes the recognized poultry authority of the community.

In a case of roup, for example, brought about by deficiencies in the ration, no amount of spraying or treatment with drugs will be effective. On the other hand, if the roup has been caused by exposure to drafts, such treatment may work, but the service man should also suggest some changes in ventilation which may be necessary to correct the condition.

Make Your Displays Sell.—Goods well displayed help to sell themselves. Modern grocery, hardware and drug stores place their goods where customers can readily see them. Tests made in drug stores have shown sales increases of as high as 100 per cent when goods were displayed openly where previously they had been hidden from view.

Window Displays.—The essentials of good window displays have already been discussed on Chapter XXIII.

Window displays offer an excellent opportunity to show brooders, feeders and fountains in actual use. Many hatcherymen who do not have window space have erected brooder houses close to the hatch-

ery where customers can be shown equipment in use under farm brooding conditions. Here it is possible for the hatcheryman to point out that the brooder stove is maintaining the proper temperature or that little or no feed is being wasted with the type of feeder used. Good healthy chicks in such a display also help to sell feed.



Fig. 134.—An Indiana hatchery which did not have window display space erected this outdoor, rain-proof case just outside the hatchery.

Since baby chicks usually are available for window displays during only part of the year, the displays during the rest of the year will have to consist of inanimate objects, but with careful planning, sacks of feed or packages of remedies can be grouped into displays that will cause people to stop and look.

In one type of display, an effort is made to get as many different products into the window as possible. Two or three displays of this type of a week or so duration can very well be included in the hatchery window display schedule for the year, but more effective displays probably can be developed if they are built around some central idea.

Sometime during the chick buying season, for example, the win-

dow display could consist of the equipment needed for starting 300 chicks, or whatever happens to be average number of chicks in each sale. Neatly lettered cards could explain why a certain amount of feeder space is needed. As a special inducement, the complete chick



Fig. 135.—A window display built around the equipment, feed, and supplies for raising a flock. (*Hatchery Tribune.*)

raising outfit could be priced under what it would cost to buy each item separately. This difference in price could be pointed out on display cards.

A summer window display could consist of sacks of growing mash, range hoppers, lice and mite remedies, and similar items. Here again, window cards could explain the importance of these products



Fig. 136.—When feed and supplies are displayed in such an open and orderly fashion as this, customers can see at a glance what the hatcheryman has for sale. (*Hatchery Tribune.*)

in developing sturdy, healthy pullets to place in the laying house in the fall. Any hatcheryman who is a well trained poultryman should experience no difficulty in building a variety of similar displays throughout the season.

Table Displays.—The modern idea in displaying goods inside a

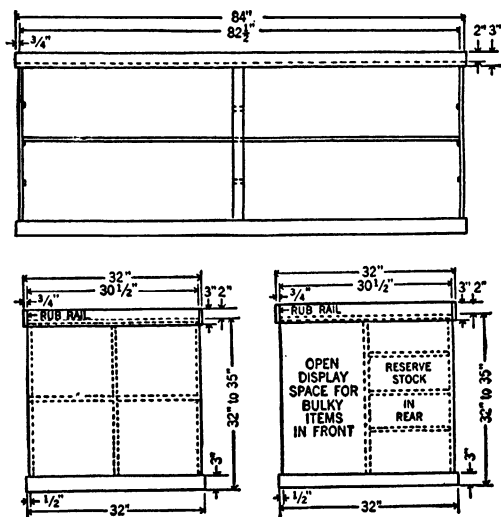


Fig. 137.—Plans for a table suitable for displaying poultry supplies in the hatchery. (*Progressive Grocer.*)

store is to put them out where customers can see them, pick them up and examine them, and sell themselves.

Plans for a display table, which is in accordance with the open display idea, are shown in Figure 137. The top of this table may be used for displaying remedies, small feeders and fountains, and other small items. If the table is constructed according to the end view at the right, the lower front part may be used for larger feeders, fountains and similar items.

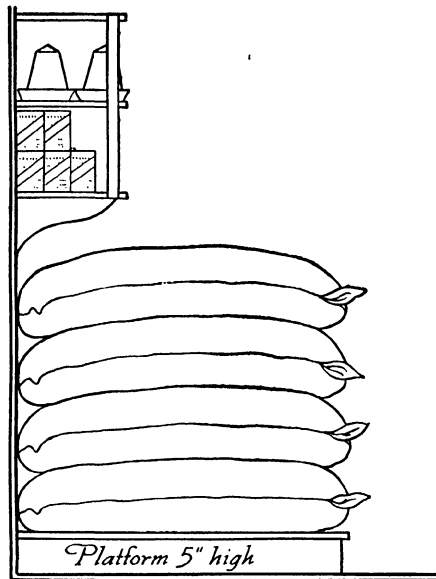


Fig. 138.—Shelving for displaying small items with platforms below utilize the wall space to good advantage. (*Hatchery Tribune.*)

Platforms.—Bulky items such as brooder stoves, feed, very large feeders and fountains, battery brooders, etc., can well be displayed on platforms. These platforms should be made 7 feet long by 2 feet 8 inches wide, and they should be from 5 to 7 inches high.

Shelves.—Where the amount of space available for storage is limited, construct shelves that are from 16 to 20 inches deep. Always bring the items to the front on the shelves, arranging them so that the labels, in the case of packaged goods, can be plainly seen.

Figure 138 shows how shelving and platforms can be combined to use the floor space of the hatchery display room to best advantage.

Floor Displays.—Small floor displays can be used to advantage in selling packaged goods such as remedies, grit, conditioners, and so on. Such a display may consist of a box 14 or 16 inches high, painted or covered with some attractive material, on which the packages are stacked up in the form of a pyramid or some similar arrangement. In order to make a strong impression, there should be enough packages to make a sizeable display. When the display gets low, move the packages to a table.

The spring months would be a good time to feature anti-cannibalism remedies, drinking water disinfectants, and other seasonable items. A little later, worm remedies could be displayed. Don't feature one item in the floor display too long at a time. Changing the product displayed as well as the location of the display, will add interest.

Interior Arrangement.—One of the problems in selling supplies is to get the customer to circulate throughout the salesroom and come in contact with more of the merchandise displayed. Proper arrangement of the various display fixtures makes it easier for customers to circulate.

Modern grocery stores and hardware stores follow the "island" plan of arrangement. Instead of having a counter or display table between the customer and the goods displayed on shelves, the display tables, platforms, and floor displays are moved away from the walls, enabling the customer to see more goods at close range. The customer can go up to the shelves, examine the goods, read the labels, or even handle items in which he is interested.

One way to increase customer circulation is to place the wrapping table toward the rear of the salesroom. Nine times out of ten, the customer will follow the salesman to the wrapping table. In doing so, he is exposed to more merchandise. Rapid selling items also should be placed toward the rear of the salesroom.

Wide aisles, of course, make it easier for the customer to walk about, but at the same time they should not be too wide, for then the customer will not be brought in close enough contact with the merchandise. For the hatchery supply salesroom, the average aisle width should be about 4 feet.

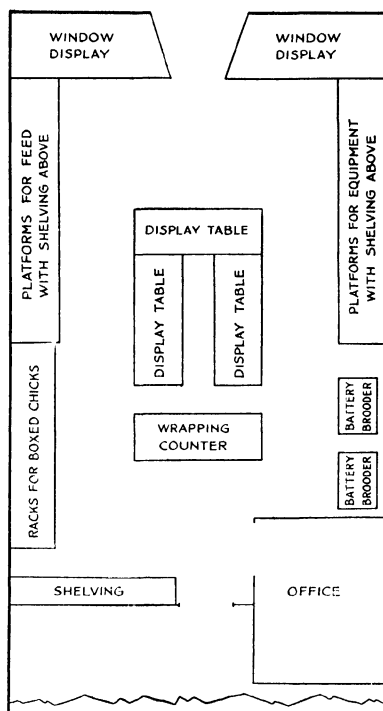


Fig. 139.—This hatchery display or sales room follows the "island" plan of arrangement, so that there are no counters between the customer and the goods that are on display. (*Hatchery Tribune*.)

Storing Feed.—Spoiled feed can easily cause serious sickness in poultry. It is necessary, therefore, that the hatcheryman use considerable care in the storage of feed to prevent spoilage.

First of all, feed should be stored in a cool dry place. In order to prevent damage through warmth or lack of ventilation, pile the bags on slats 2 or 3 inches from the floor and allow 3 or 4 inches between rows for free circulation of air. Arrange the rows of bags parallel with air drafts through the storage room, not cross-wise to them.

Have a definite system to make sure that the oldest feed is always moved first.

During spells of hot or damp weather, watch all bags carefully. Inspect them morning and evening simply by running the hand between the bags in various parts of the pile. Should there be any heating, pile the bags around on end to allow them to cool.

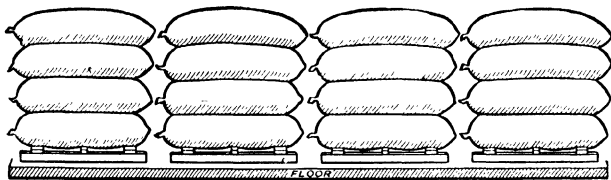


Fig. 140.—Method of piling bags of feed to allow free circulation of air.

Selling Suggestions.—Maintain a complete stock. Few poultry raisers like to switch to some other chick starter after having good success with one brand.

Folks appreciate service. Carry the sacks of feed right out to the customer's automobile.

Avoid doing a credit business on feed and supplies. "Cash and carry" reduces the overhead and makes it possible to offer special prices.

Many hatcherymen have stimulated the sale of feeds by giving a two weeks' supply of starting mash free with each order of chicks.

"Ten days' trial use" sold a large number of chick feeders for a California hatchery. Customers were given the opportunity to return the feeders and get their money back if the feeders did not prove satisfactory after 10 days' use.

"Dollar Days" and "Saturday Specials" often bring many new customers to the hatchery. The price appeal will always be one of the strongest selling appeals, and the hatcheryman who knows how to set prices for these special occasions will often succeed in getting customers to leave with more than the "bargain" items that brought them to the hatchery in the first place.

Dealer Helps.—The more progressive manufacturers of feeds and poultry supplies aid dealers in various ways. Any hatcheryman who fails to make use of the various selling helps which manufacturers provide is overlooking a real opportunity to obtain valuable

advertising helps with little or no additional cost. Among the various dealer helps available are the following:

1. Shipping box labels containing feeding instructions.
2. Booklets and circulars giving complete instructions on the feeding and care of baby chicks, as well as methods of managing the laying stock. Remedy companies often supply circulars telling how to diagnose diseases and outlining methods for treatment. Booklets and circulars are often supplied with the hatchery name imprinted.
3. Display stands for feeders and fountains.
4. Brooder thermometers to be given to each chick buyer.
5. Window display backgrounds."
6. Counter displays or posters.
7. Special letterheads. Some equipment manufacturers supply 4-page letterheads, the first page containing space for the hatcheryman's letter, and the other three pages containing descriptions of the company's products handled by the hatcheryman.
8. Cuts of equipment for use in catalogs and advertisements. Sometimes complete electros for newspaper advertisements are supplied.
9. Samples of the product.
10. Egg record sheets.
11. Calendars.

Some companies bear all the expense of sending out literature to a list of poultry raisers supplied by the hatcheryman. Many manufacturers using national advertising refer all inquiries received to the nearest dealer. Poultry feed companies often supply men to conduct poultry schools for hatcherymen, while remedy companies sometimes furnish veterinarians to conduct poultry clinics.

Other Side Lines.—Along with the sale of feed, remedies and poultry equipment, hatcherymen frequently will be found handling seeds and bulbs, dog food, bird food, rabbit food, bee supplies, flour, salt, live stock feeds and fertilizers. Some have even added lines of hardware, radios, cream separators and milking machines, depending, of course, upon whether local conditions favor the handling of these products.

The buying of eggs and poultry is another activity that is being successfully and profitably conducted by many hatcheries. A few have established cream buying stations.

An Illinois hatcheryman mounted a portable hammer mill on a truck and went from farm to farm grinding feed right at the farm granaries. A Missouri hatcheryman with a good location in town established a gasoline filling station. An Indiana farm hatchery located on a well traveled national highway operates a tourist camp during the summer.

A hatcheryman in Illinois cleared \$1,500 one summer by buying furniture at farm sales and disposing of it later by holding auctions. An ingenious Oregon hatcheryman constructed special trays for his incubators and bolstered his income for the year by "custom drying" walnuts following the regular hatching season. Operation of a cider mill is a special fall activity in an Indiana hatchery.

XXVIII

HANDLING ADJUSTMENTS

COMPLAINTS ARE danger signals. No matter how careful a hatcheryman may be in culling his flocks, incubating the eggs, and in boxing and shipping the chicks, complaints are bound to occur. Some of these may be due to errors by hatchery employees; others to conditions occurring after the chicks leave the hatchery and over which the hatcheryman has no control. Hooper (1932) found that the replacement expense ranged from 4 cents to 25 cents of the total expense of producing 100 chicks. Poffenberger and DeVault (1939) found that the cost of adjustments averaged 4 cents for each 100 chicks sold.

But all complaints should receive prompt attention. It costs plenty to get a new customer on the hatchery's books. Once he is a customer, there is no reason why he should not remain on the buying list for several years. When a complaint is ignored or handled with indifference, it doesn't leave the customer in a pleasant state of mind. And news of such treatment has a habit of spreading quickly throughout a community.

Selling chicks is largely a matter of creating satisfaction. So well do many of the larger, more successful mail order hatcheries realize this fact that an effort is made to settle each complaint to the customer's satisfaction without delay. While doubt is sometimes raised concerning the advertising claims of some of the large mail order hatcheries, poultry publications receive very few complaints against them. These hatcheries make it a point to satisfy each customer. Properly handled, adjustments often pave the way for more business from the complainants and their friends.

Forms of Adjustment.—The best type of adjustment is one which will settle the trouble and satisfy the customer with the least cost to the hatchery. This may mean actual refusal of the claim, while in other instances, the hatchery will find it advisable to make

some form of concession. When the latter course is taken, the adjustments may be handled in this manner:

1. *Replacement of the chicks*.—When the fault lies wholly with the hatchery, this replacement may be made without any cost to the customer. If the fault is undetermined, the responsibility is divided between the hatchery and the customer, the customer making a partial payment, usually half price, to have the chicks replaced. This method of settlement is likewise used where the customer's fault has been established, but where it is desirable to retain his good will.

While some poultry raisers are perfectly willing to receive the replacement chicks as soon as they can be shipped by the hatchery, most poultry raisers find it inconvenient and uneconomical to operate a brooder stove and care for such a small number of chicks. For this reason, many hatcheries issue due bills or credit slips to the amount of the value of the chicks lost. This amount may be applied on future purchases of chicks from the hatchery, making it possible for the customer to obtain the replacement chicks when most convenient for him. The advantage to the hatchery, of course, is that the customer in all likelihood will order a larger number of chicks when he makes use of his credit slip.

Some hatcheries make replacements only when the customer orders enough additional chicks to fill out a shipment of 25 chicks.

2. *Cash Refund*.—For the reason already pointed out, namely, that the average poultry raiser has no provision whereby he can properly care for the few chicks which come to him as replacements two or three weeks after the main brood has been started, most hatcherymen now make the adjustment with a cash refund.

If no open announcement of this policy is made in the hatchery's advertising matter, there is little danger of abuse. Those hatcherymen who are using the cash refund use it as a "surprise" form of settlement when it fits the occasion, and they find that it is certain of creating good will.

ADJUSTMENT LETTERS

While the hatcheryman doing a local business has some advantage in settling claims in that he is personally acquainted with his customers and can easily visit them to find out what is causing the

trouble, there is always the danger of getting into a verbal argument with the customer over the differences.

In handling adjustments by letter, however, there is an opportunity to weigh the problem carefully before making the reply. Yet, if the letter is not clear, further misunderstanding may arise.

Aims in Adjustment Letters.—Every adjustment letter written by the hatchery should attempt to (1) settle the trouble, (2) keep the customer, and (3) get new business from that customer.

Fairness to both parties concerned should be the basis on which settlement should be made, but this is not always possible, for modifications may have to be made in individual cases. Customers who buy large orders of chicks regularly probably should be treated somewhat liberally. The occasional complainant certainly should receive more consideration than the chronic kicker, while complaints which involve small amounts might best be settled immediately by making full replacement instead of going to the expense of investigation.

Handling Adjustments.—Be prompt in handling complaints. If there is too much delay, it will only aggravate the customer's grievance.

Don't be suspicious of every customer who registers a complaint. The fault may rest with the hatchery. Make an effort to find out where the trouble lies. Few people are actually dishonest, but a careful investigation of each claim will help to establish the responsibility.

Treat each claim seriously. The customer may be wholly wrong, but this is no excuse for ridiculing him. Show him that you want to serve him.

Never give way to anger in your letters. Sharp replies will simply irritate the customer, while the unreasonable kicker may just have the satisfaction of having aroused your temper.

Analyze each claim for the right solution. Then show the customer what can be done about it. Be tactful and courteous.

Hatchery at Fault; Claim Granted.—When the hatchery is at fault, acknowledge the mistake frankly, explain how it happened, correct the mistake, and close cordially with a bid for future business. Rather than keep the customer in suspense, tell him at the outset of the letter how you are going to correct the mistake.

If the customer loses a large number of chicks because they were shipped to him a week before they were due to be sent, leaving him unprepared to care for them properly on their arrival, obviously, the hatchery is at fault. His claim can be granted in this manner:

Dear Mr. Harris:

We are glad to send you our credit slip which you can use any time to replace the 53 chicks which were lost because of their arrival a week earlier than expected.

We are very sorry that this error occurred. While we make every effort to avoid mistakes of this type, now and then someone slips up on the job in spite of the various precautions that we take.

If you wish, you may have these chicks replaced immediately. Possibly, however, you may prefer to apply this credit on a larger order of chicks which can be brooded with little or no additional work. We can supply you with our Grade AAA Barred Rocks at 12 cents each at the present time.

You may be assured, Mr. Harris, that we will be doubly careful in handling your order in the future.

Cordially yours,

Hatchery Not at Fault; Claim Granted.—Even though the hatchery is not at fault, it is frequently advisable to allow the customer's claim. The fault may lie with the parcel post service, express company, or the chick buyer himself, yet when chicks die during the first two weeks under good management without any apparent reason, it is difficult to establish who is at fault. The chicks may have been chilled in transit, but the chilling could just as well have taken place in taking the chicks from the postoffice or express office to the farm, or it might have occurred in the brooder house.

Don't grant such a claim in this manner:

Dear Sir:

If your chicks began to die off so rapidly, it is certainly no fault of ours. We picked out our best chicks when we filled your order; so there is no reason why they should be dying after they have reached you alive. Quite likely they were given the wrong feed or else they were chilled in the brooder house.

However, inasmuch as we want every customer to be satisfied, we will replace these chicks at half price as soon as you send us the money for them.

Yours very truly,

If the claim is worth granting, do it cheerfully. Make the customer realize that he is receiving more than he really is entitled to, but don't do it in a manner that will cause him to feel that he has been treated as an object of charity. Leave him with a desire to repay you with future chick orders for your kindness. Write him like this:

Dear Mr. Jackson:

We regret very much to learn of the heavy losses which you had with your chicks during the first two weeks after their arrival. You are certainly justified in feeling disappointed.

Knowing that you were a new customer, we took special pains to select good, sturdy chicks when filling your order. This, no doubt, accounts for the fact that the chicks reached you with no loss other than the extras that were included.

You are very likely acquainted with the fact that most commercial organizations do not accept any responsibility for their goods after they reach the customer in sound condition. Although we could follow this policy, we put the interests of our customers above this privilege.

From the report which you submit, it appears as if the chicks may have been chilled sometime during their trip to your brooder house. In spite of the postal and express rules regarding the handling of chicks, carelessness somewhere along the line may result in overheating or chilling. Sometimes this chilling may occur in bringing the chicks from the postoffice to the farm, and the ill effects do not show up until several days later.

Because the trouble is due to something over which neither you nor ourselves have any control, we shall be glad to bear part of this loss by replacing the chicks lost at half price. We can fill your order from our next hatch, if you wish.

In the meantime, we would like to suggest that you read the enclosed booklet on brooding. The methods of feeding and caring for baby chicks outlined in this booklet are well worth trying on your next brood of chicks. Our customers who are following these methods report unusually good success with their chicks this season.

Yours very cordially,

An answer like this should satisfy the customer, make him realize that you have been more than fair, and give him a desire to reciprocate. A hatchery having a livability guarantee could grant a claim like this with a letter selling the customer on the idea that the guarantee really means something.

Refusing Claims.—Refusing claims is a difficult matter. The problem is one of getting the customer to see that his request is unreasonable and to accept your method of handling the case as fair. When writing a letter of refusal, sympathize with the customer in his problem, explain the various conditions surrounding the claim, then show him tactfully why the claim cannot be granted, and close with a friendly note.

As an example, let us take the case of a customer who has good success in brooding his chicks, but when the pullets reach the age of 10 or 12 weeks, the mortality is heavy due, let us say, to coccidiosis. The customer believes that the fault lies with the hatchery and wants it to make good. Here is how he might be answered:

Dear Mr. Barnes:

We can well appreciate how you feel concerning the heavy loss of your pullets at an age when they are so well along toward maturity.

From the detailed description of the condition of your pullets which you supplied, it looks as though your birds have a bad attack of coccidiosis, a disease caused by a small organism which does its damage in the intestines of the growing chicken. Let me quote a paragraph from Purdue University Agricultural Extension Leaflet No. 128 telling how coccidiosis may be introduced:

"Because of its ability to resist sunlight, drying, changes in temperature, etc., fresh outbreaks frequently occur when young chickens are placed in houses and yards previously occupied by a diseased flock. The disease may be introduced into the flock through purchasing diseased adult chickens that are apparently healthy. Infected droppings or parts of an infected chicken may be brought into clean yards, and an outbreak of the disease started."

From this explanation, you will readily see that the disease is in no way due to the chicks. Possibly, some visiting poultry raiser carried infected droppings on his shoes from his flock on to your range. This is a very common method of spreading poultry diseases. In view of these facts, you will in your fairness, no doubt, wish to withdraw your claim.

Since your big problem is to put a stop to this disease as quickly as possible and prevent further losses, we are enclosing a copy of an article discussing the control of coccidiosis. Put these feeding and sanitation practices into effect immediately, and we are sure you will experience beneficial results.

Cordially yours,

A letter presenting the facts in so clear a fashion should convince the customer that his claim is unreasonable. In situations like this, the hatcheryman who is a good poultryman and is familiar with diseases has an advantage, for he knows where to get the facts.

Fault Undetermined.—Sometimes when a complaint is received, it is impossible to tell whether the fault lies with the customer or the hatchery without making a further investigation. In such cases, the hatcheryman must assume an attitude of fairness. It may be that the customer has suffered heavy chick losses because of his own lack of knowledge and ability. The search for facts may be facilitated by submitting to the customer a questionnaire similar to this one used by an Illinois hatcheryman:

Name
 Address
 Shipping Address
 Breed of Chix and Number
 Date and hour chix arrived at Postoffice or Express Office
 Postoffice date stamped on lid
 Did you get them from Postoffice or were they delivered by Postmaster
 Condition they were in when you or your representative first saw them
 Were chix put with hens or brooded with brooder stove
 Were they put with other chix
 If so, how old were other chix
 If with stove, give size and where manufactured

Size of Brooder House
 Metal or wood
 How long built and when brooder stove was started before chix were put in House...
 Kind of litter used in house, straw, hay, chaff, peat, sand, etc.
 Feed fed to start chix
 Kind you are now using
 Number of chix lost to date
 General appearance at this time

If the customer has suffered unusually heavy chick losses during the first two or three weeks, this questionnaire might be accompanied with a letter to the following effect:

Dear Mr. Peterson:

We are very sorry to hear of the heavy chick losses which you have had.

In order that we may make a satisfactory adjustment and find out the cause of the trouble, will you please fill out the enclosed questionnaire completely and return to us immediately? This will enable us to handle your claim without delay. Thank you.

Cordially yours,

There is considerable danger in the use of the questionnaire. So often the customer is at fault. The hatcheryman must use good judgment in deciding whether to refuse or to grant the claim.

XXIX

HATCHERY RECORDS

GOOD RECORDS are essential for the smooth operation of a hatchery. The real value of a good set of financial records, however, lies in being able to interpret correctly the results, and then applying the conclusions to the hatchery procedure and operation.

While the hatchery operator should strive to have a complete system of records, he should avoid anything that is too complicated and involved. Since record forms for transactions with flock owners and incubator tray records have already been discussed in this volume, this chapter is concerned chiefly with financial records. The forms illustrated to emphasize the type of records needed were developed by Ohio State University.

Sources of Record Systems.—Complete bookkeeping forms and other records for sound hatchery operation can be obtained from the International Baby Chick Association. Independent accountants have also developed hatchery bookkeeping systems, and some of them have been placed on the market. These sources usually can be learned from hatchery trade publications.

Forms for keeping records of social security deductions, income tax payments and other information required in connection with the payroll can be obtained from concerns which manufacture standard office bookkeeping systems.

Handling of Orders.—Many hatcheries maintain a customers' ledger, either on cards or on loose-leaf forms, showing the total amount of their purchases, the payments on their orders, and the amounts due.

When orders are received on the order blanks sent out in the hatchery's mail advertising, the total amount of each order is entered on the customer's record along with an entry for the amount of money received with the order. The order blank is then filed according to the date on which shipment is to be made. When this

date arrives, all orders are taken from the file, shipping labels properly addressed, and the orders sent to the shipping room to be filled.

So as to have complete record of all sales, an order blank should also be made out for each sale of chicks to local customers who call at the hatchery. The amount of each order should be posted to the customer's account and the order blank then filed with other orders shipped out from that particular hatch.

If there is a surplus of chicks and they are to be placed in the storage brooders, an order blank should be filled out giving the number of chicks and using the name "brooder" as the customer.

Similar order blanks should be made for custom hatching, sales of brooded chicks, chicks shipped as replacements, and chicks shipped to customers for other hatcheries which happen to be short on chicks, making a notation on each order blank as to the particular type of transaction.

If an order blank is made out for each sale from the hatchery, it will then be possible to file these blanks by weeks or by hatching periods and to summarize them later for a complete record of sales of the hatchery.

With so much reliance on the order blank as a source of all entries for sales, it is necessary that this blank be complete in every respect. Order blanks or sales slips used for baby chicks should include the name and address of the customer, quantity, variety, unit price and total value. Orders received by mail should, of course, include the shipping date desired and possibly second choice in variety. Sales of brooder chicks should show quantity, variety, unit price, age of chicks and total value. Custom hatching sales should show the number of eggs, the number of chicks, and the total amount charged for the service.

Duplicate Copy System.—Some hatcheries do not use the order blanks submitted by the customers as part of the record keeping system. Instead, a copy of the order is made out in duplicate or triplicate as soon as it is received.

One copy of the order is used as a record with the customer and takes the place of the customer's ledger card. The second copy is used as a shipping copy and filed according to the date on which shipment is to be made. The third copy is mailed to the customer

as an acknowledgment of the order. From this point, however, the plan of record keeping is the same as that previously described.

Production Record.—In order that the hatchings of chicks keep pace with the sales and promises of future delivery of chicks, some record showing the number of chicks already ordered for a certain week is desirable. Such a record is shown in Figure 141.

Besides furnishing a record for each hatching date, this form makes it possible for the hatchery operator to set down under each variety and quantity of eggs secured from flocks of these varieties, an estimate of the number of chicks which will be available, and the number of chicks actually hatched. Below this he can indicate the quantity of chicks already ordered in each variety. By referring to this information before setting the incubator, the hatcheryman may find it advisable to set less eggs of certain varieties and more of others for that particular hatch.

Record of Income.—If complete records of every sales transaction have been kept as outlined in the section of this chapter on "Handling of Orders," it will be easy to summarize the sales in the income journal shown in Figure 142. This summary should be made for each hatching period. In some cases these results will cover one week; in hatcheries taking off hatches twice a week, just half a week.

The customary procedure is to sort out all order blanks or sales slips for the particular hatching period and group them according to baby chick sales, feed and supply sales, custom hatching, and sales from brooder, summarizing the information obtained from these records under the respective headings in the income journal.

Record of Cash Receipts.—Although the income from various sources has been summarized in the income journal, a record of cash receipts showing the names of the customers, payments received, date received, and the amount still due, is desirable. A form for this record is shown in Figure 143.

After the receipts for a day have been recorded, the column "Total Cash Received" should be totaled. The figure obtained should agree with the amount of cash and checks on hand. If this sum is of any size, it should be deposited in the bank, and an entry for the total of this deposit made in the bank deposits column on the last line on which a cash entry had been made.

[illegible]

Fig. 141.—Record of production.

[illegible]

Fig. 142.—Income journal for summarizing sales.

[illegible]

Fig. 143.—Form for recording cash receipts.

Disbursements.—Probably the most accurate method of keeping a record of all expenditures is to deposit all receipts in a checking account and pay all bills by means of check, making the proper notation on the check stub. Very few items should be paid in cash. Where it is necessary to have some cash on hand to pay for very small items, a check should be issued to "cash" for a small amount

ASSETS					<i>Start of Season Date.....</i>	<i>End of Season Date.....</i>
Cash on Hand					_____	_____
Cash in Bank					_____	_____
Accounts due from Customers					_____	_____
Notes Receivable					_____	_____
Feed and Supplies on Hand					_____	_____
Eggs on Hand (Number of Doz.)...					_____	_____
Baby Chicks on Hand (Number)....					_____	_____
Poultry on Hand (Number).....					_____	_____
Prepaid Expenses					_____	_____
Equipment:						
	<i>Make</i>	<i>Capac- ity</i>	<i>Year Pur.</i>	<i>Orig. Value</i>		
Incubators					_____	_____
.....					_____	_____
Hatchery Equip.					_____	_____
.....					_____	_____
Brooders					_____	_____
.....					_____	_____
Office Equipment					_____	_____
.....					_____	_____
Bldg's. & Land					_____	_____
Total Assets (1)					=====	=====
LIABILITIES						
Customers Deposits on Orders					_____	_____
Due to Trade Creditors.....					_____	_____
Due to Banks					_____	_____
Due to Equipment Manufacturers					_____	_____
Due on Mortgages					_____	_____
Total Liabilities (2)					=====	=====
NET WORTH (1)—(2)					=====	=====

Fig. 145.—Suggested form for hatchery inventory.

which may be kept in the office. When a payment is made from this petty cash fund, a notation should be made on a slip of paper and placed in the cash box.

A form for recording the payments by check is shown in Figure 144.

Inventory.—An inventory showing the assets and liabilities of the hatchery should be compiled at the beginning of the hatchery season, and another should be compiled to show the condition at the end of the season. The season for some hatcheries will close on June 31, while for others doing a year around business it will close on December 31.

A form for listing the various items in the hatchery inventory, as suggested by the Ohio Bureau of Business Research, appears in Figure 145.

XXX

FAIR TRADE PRACTICES

THE MAJORITY of hatchery operators adhere to high standards in their business practices, but there are always some individuals who will try most anything to obtain an unfair advantage over their competitors. Then, too, there are those who violate good business ethics through sheer ignorance.

Over most of its history, the International Baby Chick Association has been active in promoting fair trade practices within the hatchery industry. One of its attempts to discipline a member who had been violating the organization's code of ethics culminated in the killing of the president of the association and the wounding of the secretary just prior to the opening of the convention at Milwaukee in the summer of 1932.

Baby Chick Code.—When the National Recovery Act was passed in 1933, a code of fair competition for the chick hatchery was proposed by the International Baby Chick Association and the National Poultry Council. The code was approved by President Roosevelt on December 29, 1933, and it became effective on January 1, 1934. It was the eighth code to go into effect under the National Recovery Act.

Since the primary purpose of NRA was to lift the country out of the depression, the code was concerned largely with wages and hours in hatcheries, and enforcement centered largely on preventing hatcheries from selling chicks below their cost of production. Each hatchery had to be able to furnish figures on costs to justify its selling prices. Enforcement was handled by the National Commercial and Breeder Hatchery Coordinating Committee, which consisted of 21 members selected by the industry on a regional basis, plus the Secretary of Agriculture and the Administrator of the National Recovery Act.

Article VI of the code dealt with unfair methods of competition

and included defamation of competitors, distress sales, deceptive advertising, rebates, misrepresentation, use of various terms, and other forbidden practices.

To make sure that the trade practice rules would persist, regardless of what might happen to NRA, the hatchery industry filed these rules with the Federal Trade Commission which promulgated them on November 25, 1933.

Trade Practice Rules.—When NRA was declared unconstitutional by the United States Supreme Court in 1935, the Federal Trade Commission, with the help of a committee established by the International Baby Chick Association, became active in enforcing the fair trade practice rules. These rules were revised as the result of an industry conference in St. Paul in the summer of 1935. This was followed by a hearing in Washington and the trade practice rules for the baby chick industry were promulgated by the Federal Trade Commission on December 31, 1938.

Numerous stipulations, concerned mainly with misrepresentation in advertising, have been issued by the Federal Trade Commission. Many of the violations have been the result of the human tendency to exaggerate. In others, the violations seemed to be concerned with technicalities.

The Commission's methods of holding hearings have been open to some criticism, for the commission acts as both prosecutor and judge, and the procedure differs from that in the civil courts where a man is innocent until proved otherwise. The trade practice rules, however, are sound, and every hatchery operator should be familiar with them. They are as follows:

TRADE PRACTICE RULES FOR THE BABY CHICK INDUSTRY as promulgated December 31, 1938

Statement by the Commission:

Trade practice rules for the Baby Chick Industry, as herein set forth, are promulgated by the Federal Trade Commission under its trade practice conference procedure.

The general purpose of the rules is to foster and promote fair competitive conditions and the protection of the purchasing and consuming public, and to this end to eliminate and prevent misrepresentation, deceptive concealment, and other unfair methods of competition or unfair or deceptive acts or practices.

In the course of the proceedings an industry's conference was held in St. Paul, Minnesota, under the Commission's auspices, and proposed trade practice rules were submitted by members of the industry. Subsequently, tentative action was taken by the Commission on the rules so submitted and a draft of proposed rules was made

available upon public notice of at least fifteen days, in pursuance of which all interested and affected parties were afforded opportunity to present such pertinent facts, suggestions or objections as they desired and to be heard in respect to the proposed rules. At the public hearing held in Washington, all matters submitted orally or in writing were received and filed in the proceeding.

Thereafter, and upon consideration of the entire matter, final action was taken and the rules in the form appearing herein under Group I and Group II were respectively approved and received by the Commission.

The rules for the Baby Chick Industry herein promulgated supersede and replace prior rules for the industry as published by the Federal Trade Commission on November 25, 1933.

These rules promulgated by the Commission are designed to foster and promote fair competitive conditions in the interest of the industry and the public. They are not to be used, directly or indirectly, as part of or in connection with any combination or agreement to fix prices, or for the suppression of competition, or otherwise to unreasonably restrain trade.

GROUP I

The unfair trade practices which are embraced in these Group I rules are considered to be unfair methods of competition, unfair or deceptive acts or practices, or other illegal practices, prohibited, within the purview of the Federal Government, by acts of Congress, as construed in the decisions of the Federal Trade Commission or the courts; and appropriate proceedings in the public interest will be taken by the Commission to prevent the use, by any person, partnership, corporation or other organization, of such unlawful practices in or directly affecting interstate commerce.

Definition: The term "baby chicks" as used in these rules shall be understood as including turkey poults, goslings, ducklings, or other live young poultry to be raised for breeding purposes or for the production of eggs and other poultry products.

RULE 1—*Misrepresentation of Products:*

It is an unfair trade practice, in the course of or in connection with the offering for sale, sale or distribution of baby chicks, to make or publish, or cause to be made or published, directly or indirectly, any false, misleading or deceptive statement or representation (whether in the form of advertisement, guarantee, warranty, testimonial, endorsement, depiction, illustration, or other form of representation, however disseminated or published):

(a) Concerning the grade, quality, quantity, breed, pedigree, type, sex, sexing, quick maturity, uniform development, character, nature, origin, weight, color or size of such baby chicks; or

(b) Concerning the production, sale or distribution of any such baby chicks; or

(c) Concerning the purported supervision, endorsement or approval of any poultry breeding, hatching or other operation by Federal, State or other authority; or

(d) Concerning any other matter in relation to such baby chicks.

RULE 2—*Deceptive Concealment of Material Facts:*

In advertising, offering for sale or selling baby chicks, it is an unfair trade practice for any member of the industry to conceal or fail or refuse to disclose any material facts for the purpose or with the effect of thereby misleading or deceiving purchasers, as for example:

(a) Filling baby chick orders with cockerels which have been obtained from sexed chicks or from other sources without having disclosed to the purchaser at the time of sale the fact that the baby chicks delivered are cockerels;

(b) Adding surplus cockerel chicks to so-called "straight-run" chicks and offering for sale, selling or delivering same to customers without informing the respective purchasers of the fact that such surplus or added cockerels have been included and without obtaining such purchasers' consent thereto.

(Note: The above examples are but a few illustrations of the scope of rule 2.)

RULE 3—(a) Misuse of Words "Guaranteed to Live," Etc.:

(b) Use of Deceptive Guarantees as to Livability of Baby Chicks, Etc.:

(a) It is an unfair trade practice to advertise, guarantee, describe or otherwise represent that baby chicks sold or offered for sale are "guaranteed to live," or to make similar statements or representations, with the purpose or with the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers into the erroneous belief that the said baby chicks possess extraordinary stamina or other qualities which prevent disease or death.

(b) It is an unfair trade practice to make or publish, or cause to be made or published, directly or indirectly, any false, misleading or deceptive statement, guarantee, warranty or other representation concerning the livability, health or stamina of baby chicks sold or offered for sale.

RULE 4—Misrepresentation as to Yields of Eggs:

It is an unfair trade practice to advertise, guarantee, describe or otherwise represent, directly or indirectly, that very high yields of eggs are received from all flocks of a particular seller or producer when such is not the fact, or when such statement or representation is true only as to a small percentage or proportion of his flocks.

RULE 5—Misrepresentation as to Blood Testing, Etc.:

(a) It is an unfair trade practice to advertise, guarantee, describe or otherwise represent, directly or indirectly, that all baby chicks or other poultry sold or offered for sale have been blood tested, pullorum tested, vaccinated, inoculated, or otherwise treated for any disease when such is not the fact, or when only a portion of the flocks supplying the eggs have been so treated or tested during the current season.

(b) It is an unfair trade practice to use any disease control term such as "pullorum tested," "blood tested," or the like, in advertising or otherwise, in such manner as to have the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers into the belief that officially approved methods have been used in making these tests when such is not the fact.

RULE 6—Deceptive Substitution of Inferior Chicks For Those Ordered:

It is an unfair trade practice to advertise, guarantee, describe or otherwise represent that the flocks of a particular seller or producer possess certain good qualities, such as ability to resist disease or to produce high yields of eggs, or the like, and then upon receipt of customers' orders for baby chicks from the flocks advertised, filling same from flocks of an inferior quality, without informing the purchasers of such substitution.

RULE 7—Deceptive Sale of Chicks at Purported Bargain Prices:

It is an unfair trade practice to sell or offer to sell baby chicks of poor grade or quality at so-called "bargain prices" or at any other prices, through advertisements or otherwise, from a farm or hatchery advertised or bearing a reputation for high grade production, without informing purchasers or prospective purchasers as to the poor grade or quality of such chicks and with the tendency and capacity or effect of thereby misleading or deceiving them into the erroneous belief that they are receiving a bargain when such is not the fact.

RULE 8—Misrepresentation as to Egg Production Qualities of Poultry:

In the case of a producer of baby chicks mating with his flocks a limited number

of males having a record for transmitting high egg production qualities while mating therewith other males having no such record, it is an unfair trade practice to offer baby chicks for sale from his flocks, through advertising or otherwise, in such manner as to have the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers into the belief that all of such chicks possess the same high egg production qualities as the said males of high pedigree, or that such flocks have been mated exclusively with males having a record for transmitting high egg production qualities, when such is not the fact.

RULE 9—*Deceptive Use of "Leaders":*

It is an unfair trade practice to offer for sale, advertise or otherwise represent baby chicks as being of a certain high grade or quality, offered at claimed "bargain prices" and under circumstances which have the capacity and tendency or effect of misleading or deceiving purchasers or prospective purchasers into the belief that an adequate supply of such chicks is available to purchasers at such prices, or that all chicks so offered for sale or sold under such representations and conditions are of the same high grade or quality, when such is not true in fact.

RULE 10—*Misuse of Words "Hatchery," "Chickery," "Chick Nursery," "Farm," "Poultry Farm," "Breeding Farm," "Incubators," Etc.:*

(a) It is an unfair trade practice for any person, partnership or corporation by trade or corporate name, through advertising or otherwise, to hold himself or itself out as owning or operating a hatchery, chickery, chick nursery, farm, poultry farm, breeding farm, incubators, or the like, when such is not the fact.

(b) In the sale or offering for sale of baby chicks, through advertising or otherwise, it is an unfair trade practice for any person, partnership or corporation to represent that such chicks have been produced by the said person, partnership or corporation, or have been produced under certain conditions, when such is not the fact.

RULE 11—*Deceptive Guarantees or Representations as to Percentage of Chicks Alive at Buyer's Destination:*

It is an unfair trade practice to make false, misleading or deceptive guarantees, warranties, or other representations to the effect that a certain percentage of the chicks shipped will be alive at buyer's destination, and then fail to adjust losses pursuant to representations made, with the purpose or with the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers.

RULE 12—*Misrepresenting Chicks Sold at Auction, Through Shipment to Fictitious Consignees, Through Agents, Salesmen or Dealers, Etc.:*

It is an unfair trade practice to cause baby chicks to be sold under deceptive or misleading conditions, at auction sales, through shipment to fictitious consignees, or through agents, salesmen, dealers, or otherwise, whether by means of false, misleading or deceptive statements or representations or by means of deceptive concealment of material facts.

RULE 13—*Deceptive Testimonials:*

It is an unfair trade practice for any member of the industry to publish or use misleading or deceptive testimonials regarding exceptional results alleged to have been obtained by buyers of his chicks, which testimonials are so worded as to have the tendency and capacity or effect of inducing purchasers or prospective purchasers to believe that all of such member's chicks may be expected to produce similar results for all buyers when such is not the fact.

RULE 14—*Misuse of Word "Free":*

The use of the word "free," or the equivalent thereof, where not properly or fairly

qualified when the article is in fact not free, with the tendency or capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice.

RULE 15—*Misrepresenting Chicks as from Stock Entered in Egg-Laying Contests or Poultry Shows, Etc.:*

It is an unfair trade practice to advertise, guarantee, describe or otherwise represent that baby chicks sold or offered for sale are from, or are closely related to, stock entered in egg-laying contests or poultry shows, or the like, when such is not the fact.

RULE 16—*Misuse of Terms "Trapnest," "Trapped," Etc.:*

It is an unfair trade practice to use the terms "trapnest," "trapped," or the like, in such manner as to have the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers into the belief that all baby chicks sold or offered for sale are hatched from eggs produced by hens that are actually being trapped, or have been trapped for at least one year, when such is not the fact.

RULE 17—*Deceptive Depictions:*

It is an unfair trade practice to use photographs, cuts, engravings, illustrations, or pictorial or other depictions or devices, in catalogues, sales literature or advertisements, or otherwise, in such manner as to have the capacity and tendency or effect of misleading or deceiving purchasers or prospective purchasers as to the size, importance or location of the premises occupied by a member of the industry, as to such member's equipment, as to his breeding flocks or poultry products, or as to any phase of his poultry hatching, breeding, or other operations.

RULE 18—*Deceptive Representations as to Earnings, Etc.:*

It is an unfair trade practice to make false, misleading or deceptive statements or representations regarding opportunities for making money or actual or probable earnings of agents or dealers handling hatching eggs, baby chicks or other poultry, or of purchasers raising baby chicks or other poultry, which products are being offered for sale or sold by a member of the industry.

RULE 19—*Deception as to Transportation Charges:*

(a) It is an unfair trade practice to sell or offer to sell baby chicks, through advertising or otherwise, in such manner as to mislead or deceive purchasers or prospective purchasers into the belief that the prices quoted for such chicks are the prepaid or delivered prices when such is not the fact.

(b) It is an unfair trade practice, by failing correctly to inform customers or by other deception, to cause purchasers to believe that transportation costs will not be charged against them in C.O.D. charges or otherwise, when such is not true in fact.

RULE 20—*Publishing or Circulating of False or Misleading Price Quotations, Price Lists, Etc.:*

The publishing or circulating by any member of the industry of false or misleading price quotations, price lists, terms or conditions of sale, with the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers, is an unfair trade practice.

RULE 21—*Misrepresenting Offer as "Special":*

It is an unfair trade practice to represent an offer as "Special" when it is in fact a "regular" offer.

RULE 22—*Fictitious Prices:*

Offering baby chicks for sale at prices purported to be reduced from what are in fact fictitious prices, or offering such chicks for sale at a purported reduction in price when such purported reduction is in fact fictitious, with the tendency and capacity or

effect of misleading or deceiving purchasers or prospective purchasers, is an unfair trade practice.

RULE 23—*Misrepresenting Offer as Limited to Time, Etc.:*

It is an unfair trade practice to represent an offer to be limited as to time or otherwise when such is not the fact.

RULE 24—*Bogus Independents:*

It is an unfair trade practice to sell or offer to sell industry products through a pretended independent concern in such manner as to mislead or deceive purchasers or prospective purchasers into the erroneous belief that such concern is independent and in competition with that member of the industry owning or controlling such concern.

RULE 25—*Schemes Involving Lottery, Misrepresentation or Fraud:*

The offering or giving of prizes, premiums or gifts in connection with the sale of industry products or as an inducement thereto by any scheme which involves lottery, misrepresentation or fraud, is an unfair trade practice.

RULE 26—*Misuse of Word "Guarantee," Etc.:*

It is an unfair trade practice to use the word "guarantee," or any other word, expression or representation of similar import, in such manner as to have the tendency and capacity or effect of misleading or deceiving purchasers or prospective purchasers.

RULE 27—*Defamation of Competitors or Disparagement of Their Products:*

The defamation of competitors by falsely imputing to them dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representations, or the false disparagement of the grade, quality or manufacture of the products of competitors, or of their business methods, selling prices, values, credit terms, policies or services, is an unfair trade practice.

RULE 28—*"Loss Leaders":*

The practice of selling any product of the industry below the seller's cost as a "loss leader" to induce the purchase of any other product of the industry, the sale of the latter being used to recoup the loss sustained on the "loss leader" product so sold, with the tendency or capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice.

RULE 29—*Inducing Breach of Contract:*

Inducing or attempting to induce the breach of existing lawful contracts between competitors and their customers or their suppliers by any false or deceptive means whatsoever, or interfering with or obstructing the performance of any such contractual duties or services by any such means, with the purpose and effect of unduly hampering, injuring or prejudicing competitors in their businesses, is an unfair trade practice.

RULE 30—*Enticing Away the Employees of Competitors:*

Wilfully enticing away the employees of competitors, with the purpose and effect of unduly hampering, injuring or prejudicing competitors in their businesses, is an unfair trade practice.

RULE 31—*Espionage:*

The securing of information from competitors concerning their businesses by false or misleading statements or representations or by false impersonation of one in authority and the wrongful use thereof to unduly hinder or stifle the competition of such competitors is an unfair trade practice.

RULE 32—Coercing Purchase of One Product as a Prerequisite to the Purchase of Other Products:

The practice of coercing the purchase of one or more products as a prerequisite to the purchase of one or more other products where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade is an unfair trade practice.

RULE 33—Consignment Selling:

It is an unfair trade practice for any member of the industry to use the practice of shipping goods to dealers or distributors on consignment or pretended consignment for the purpose and with the effect of artificially clogging trade outlets and unduly restricting competitors' use of said trade outlets in getting their goods to consumers through regular channels of distribution, or with such purchase to entirely close said trade outlets to such competitors so as to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade; *provided, however*, that nothing herein shall be construed or used as restricting or preventing consignment shipping or marketing of commodities in good faith, and without artificial interference with competitors' use of the usual channels of distribution in such manner as thereby to suppress competition or restrain trade.

RULE 34—Selling Below Cost:

The selling or offering for sale by baby chicks or "started chicks" below the seller's cost with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or unreasonably restrain trade is an unfair trade practice; all elements recognized by good accounting practice as proper elements of such cost shall be included in determining cost under this rule.

RULE 35:

(a) *Prohibited Discriminatory Prices, or Rebates, Refunds, Discounts, Credits, Etc.¹ Which Effect Unlawful Price Discrimination.* It is an unfair trade practice for any member of the industry engaged in commerce,² in the course of such commerce, to grant or allow, secretly or openly, directly or indirectly, any rebate, refund, discount, credit, or other form of price differential,¹ where such rebate, refund, discount, credit, or other form of price differential effects a discrimination in price between different purchasers of goods of like grade and quality, where either or any of the purchasers involved therein are in commerce,² and where the effect thereof may be substantially to lessen competition or tend to create a monopoly in any line of commerce,² or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination or with customers of either of them: *Provided, however—*

(1) That the goods involved in any such transaction are sold for use, consumption, or resale within any place under the jurisdiction of the United States;

(2) That nothing herein contained shall prevent differentials which make only due allowance for differences in the cost of manufacture, sale, or delivery resulting from the differing methods or quantities in which such commodities are to such purchasers sold or delivered;

(3) That nothing herein contained shall prevent persons engaged in selling goods, wares, or merchandise in commerce² from selecting their own customers in bona fide transactions and not in restraint of trade;

(4) That nothing herein contained shall prevent price changes from time to time where made in response to changing conditions affecting either (a) the market for the goods concerned, or (b) the marketability of the goods, such as, but not limited to, actual or imminent deterioration of perishable goods, obsolescence of

seasonal goods, distress sales under court process, or sales in good faith in discontinuance of business in the goods concerned.

¹ Paragraph (a) of Rule 35 shall not be construed as embracing practices prohibited by paragraphs (b), (c) and (d) of this rule.

² As herein used, the word "commerce" means trade or commerce among the several States and with foreign nations, or between the District of Columbia or any Territory of the United States and any State, Territory, or foreign nation, or between any insular possessions or other places under the jurisdiction of the United States, or between any such possession or place and any State or Territory of the United States or the District of Columbia or any foreign nation, or within the District of Columbia or any Territory or any insular possession or other place under the jurisdiction of the United States: Provided, That this shall not apply to the Philippine Islands.

(b) *Prohibited Brokerage and Commissions.* It is an unfair trade practice for any member of the industry engaged in commerce, in the course of such commerce, to pay or grant, or to receive or accept, anything of value as a commission, brokerage, or other compensation, or any allowance or discount in lieu thereof, except for services rendered in connection with the sale or purchase of goods, wares, or merchandise, either to the other party to such transaction or to an agent, representative, or other intermediary therein where such intermediary is acting in fact for or in behalf, or is subject to the direct or indirect control, of any party to such transaction other than the person by whom such compensation is so granted or paid.

(c) *Prohibited Advertising or Promotional Allowances, Etc.* It is an unfair trade practice for any member of the industry engaged in commerce² to pay or contract for the payment of advertising or promotional allowances or any other thing of value to or for the benefit of a customer of such member in the course of such commerce as compensation or inconsideration for any services or facilities furnished by or through such customer in connection with the processing, handling, sale, or offering for sale of any products or commodities manufactured, sold, or offered for sale by such member, unless such payment or consideration is available on proportionally equal terms to all other customers competing in the distribution of such products or commodities.

(d) *Prohibited Discriminatory Services or Facilities.* It is an unfair trade practice for any member of the industry engaged in commerce² to discriminate in favor of one purchaser against another purchaser or purchasers of a commodity bought for resale, with or without processing, by contracting to furnish or by furnishing, or by contributing to the furnishing of, any services or facilities connected with the processing, handling, sale or offering for sale of such commodity so purchased upon terms not accorded to all purchasers on proportionally equal terms.

(e) *Illegal Price Discrimination.* It is an unfair trade practice for any member of the industry or other person engaged in commerce,² in the course of such commerce, to discriminate in price in any other respect contrary to Section 2 of the Clayton Act as amended by the Act of Congress approved June 19, 1936 (Public No. 692, 74th Congress), or knowingly to induce or receive a discrimination in price which is prohibited by such section as amended.

RULE 36—*Aiding or Abetting Use of Unfair Trade Practices:*

For any member of the industry knowingly to aid or abet another member, or any other person, firm or corporation, in the use of unfair trade practices, is an unfair trade practice.

GROUP II

The trade practices embraced in Group II rules do not, *per se*, constitute violations of law. They are considered by the industry either to be unethical, uneconomical or otherwise objectionable; or to be conducive to sound business methods which the industry desires to encourage and promote. Such rules, when they conform to the above

specifications and are not violative of law, will be received by the Commission, but the observance of said rules must depend upon and be accomplished through the cooperation of the members of the industry concerned, exercised in accordance with existing law. Where, however, such practices are used in such manner as to become unfair methods of competition in commerce or a violation of any law over which the Commission has jurisdiction, appropriate proceedings will be instituted by the Commission as in the case of violation of Group I rules.

RULE A:

The industry condemns the practice of disposing of baby chicks by shipping them to fictitious consignees or without an order or other consent of the consignee, necessitating the sale of such undeliverable shipments at public auction by agents of the common carrier in order to secure payment for transportation costs. Such practice is deemed by the industry to be harmful to the chicks and to facilitate the spread of disease.

RULE B:

The industry condemns the practice of failing to give proper notice to purchasers of baby chicks of any change in the shipping schedule of an order thereby causing inconvenience and loss to purchasers.

RULE C:

The industry condemns the practice of failing to ship baby chicks to customers as promptly as has been agreed upon, which practice frequently results in injury to the chicks and inconvenience and loss to customers.

RULE D:

The industry approves the practice of handling business disputes between members of the industry and their customers in a fair and reasonable manner, coupled with a spirit of moderation and good will, and every effort should be made by the disputants themselves to compose their differences. If unable to do so they should, if possible, submit these disputes to arbitration.

RULE E:

Lawful contracts are business obligations which should be performed in letter and in spirit. The repudiation of contracts by sellers on a rising market or by buyers on a declining market is condemned by the industry.

A Committee on Trade Practices is hereby created by the industry to cooperate with the Federal Trade Commission and to perform such acts as may be legal and proper to put these rules into effect.

KNOW YOUR BUSINESS

SUCCESSFUL OPERATION of a hatchery involves (1) the production of good chicks, and (2) the selling of those chicks in large enough volume and at prices sufficient to return a profit.

The underlying purpose of this book is to offer information and describe methods that will help the average hatchery operator achieve these two objectives. Naturally, the hatchery operator must be well informed on poultry breeding, flock management, incubation methods and shipping practices if he is to place chicks of good quality in the hands of his customers. Likewise, he must know how and where to obtain buyers as well as how to create satisfaction, for good chicks without buyers for them is not a profitable combination.

Success will come much easier to the hatcheryman who has an insatiable thirst for new ideas which may help him to improve the quality of his chicks or to increase the effectiveness of his sales program. Every hatchery operator has it within his power to become better informed and more efficient in the management of his business if he will:

1. Maintain an accurate system of records. Good records provide a clear picture of the condition of his business at any time.

2. Read all the available information pertaining to the operation of hatchery. The hatchery trade papers will probably constitute the chief source of information, but the general poultry magazines, poultry books, hatchery association organs, experiment station bulletins, as well as the literature issued by manufacturers will also be fertile sources of ideas.

3. Study the economics of the poultry industry . . . egg and poultry production, price trends, chick output, etc.

4. Attend hatchery schools and conventions. It is surprising how many new ideas can be picked up from other hatcherymen and workers in the poultry industry at gatherings of this type.

5. Cooperate with other hatcherymen. This may mean membership in a state or national hatchery association, or participation in the activities of a hatchery group covering only a few counties in a state. Group action can do more than individual effort to protect hatcherymen against discriminating laws, to work for uniform breeding plans, and to raise the standard of ethics in the industry.

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